

# ***Predator Gas & Gas SE***

## ***Instruction Manual***



### ***SPECIFICATIONS***

|                   | <u>Gas</u> | <u>Gas SE</u> |
|-------------------|------------|---------------|
| ⇒ MAIN BLADES     | 710mm      | 700mm         |
| ⇒ MAIN ROTOR SPAN | 62.2 in    | 61.4 in       |
| ⇒ TAIL ROTOR SPAN | 10.5 in    | 11.2 in       |
| ⇒ OVERALL LENGTH  | 56.9 in    | 56.9 in       |
| ⇒ HEIGHT          | 18 in      | 18 in         |
| ⇒ ENGINE          | Z231H      | Z260H         |

***Century Helicopter Products***

Designed and Developed in USA

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# **Building Instructions for the Predator Gas eCCPM helicopter kits.**

## **Introduction**

Congratulations on your purchase of Century Helicopter Product's newest RC helicopter model. The Predator Gas eCCPM is an excellent addition to Century's Predator model helicopter line. The two stroke gasoline Predator is well suited for all flying levels and lowers fuel costs while extending into markets where the glow engines cannot compete. Compared to other 60 class models, pilots will be elated to find the Predator Gas is easy to build. This kit will exceed your expectations for precision control at an affordable price.

In order to take advantage of the Predator's performance capabilities we recommend using a high quality computer radio system with 120 degree eCCPM mixing. The radio system should have at least 8 channels to use modern heading lock gyros and throttle governors. The radio should also have a minimum of 5 programmable points on both throttle and pitch curves. Servos used should be a matched set of 3 for the collective system, be of quality coreless, ball bearing and having a minimum torque rating of 70 oz/in. The tail rotor servo should have a servo speed of 0.11sec/60 degrees or better.

## **Warning**

This radio controlled model is not a toy! It is a precision machine requiring proper assembly and setup to avoid accidents. It is the responsibility of the owner to operate this product in a safe manner as it can inflict serious injury otherwise. It is recommended that if you are in doubt of your abilities, seek assistance from experienced radio control modelers and associations. As manufacturer, we assume no liability for the use of this product.

## **Pre-assembly Information**

Upon opening the kit, all the major component parts are bagged by relationship to the different sections of the helicopter. Various assemblies have been pre-assembled only requiring the final assembly. The particular parts, screws and nuts required for each step are packaged in the same bag as the parts. Be careful when opening each bag as not to lose any hardware. As a reminder, all metal to metal screw assemblies require L242 Blue thread lock compound, all metal to plastic screw assemblies require slow setting cyanoacrylate adhesive (Slow CA) and all bearing race to metal shafts should use L262 Red threadlock compound.

Care has been taken in filling and packing of each bag however mistakes do happen, if there is a parts shortage or missing hardware please contact us at:

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### **Helicopter Building Safety**

Upon opening the helicopter kit, various components have been pre-assembled to allow the builder to progress quickly through the construction process. Ultimately, it is your responsibility to check and verify that all components are installed and setup to operate properly.

# Predator Gas & Gas SE Construction Manual

This manual has been written for both the Predator Gas, CN1303 & Predator Gas SE, CN1304 series of helicopter kits. The manual follows a step by step approach to building the helicopter with highlight labeling for components that are included in the Gas SE only.

Every attempt has been made to ease the assembly of your kit, at each step where there are complex assemblies you can read the detailed written instructions to walk you through each step. Remember to take a few minutes before each step to carefully examine the step in order to become familiar with the parts and assembly sequence before beginning that step.

Symbols used to help assist you in building the kit:

|                                                                                                                                                             |                                                                         |                                                                                                                                                         |                                                                         |                                                                                                                                                        |                                                                             |                                                                                                                                                       |                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
|                                                                            | Full Scale Drawing                                                      |                                                                        | Repeat Steps as specified                                               |                                                                       | Partially tighten                                                           |                                                                    | Helpful Tip                                                            |
|                                                                            | Apply oil                                                               |                                                                        | Apply threadlock                                                        |                                                                       | Purchased Separately                                                        |                                                                    | Cut away Shaded Portion                                                |
|                                                                            | Special Attention                                                       |                                                                        | Apply JB Weld                                                           |                                                                       | Apply Grease                                                                |                                                                    | Apply CA glue                                                          |
|                                                                          | Remove oil residue from fasteners before applying any threadlock agent. |                                                                      | Tap holes with machine screws before installing steel balls in plastic. |                                                                     | Tap holes with machine screws before installing self tap screws in plastic. |                                                                  | Tap holes with machine screws carefully in plastic holes with bottoms. |
| Hardware Description and Identification:                                                                                                                    |                                                                         |                                                                                                                                                         |                                                                         | M3x6 = 3x6mm and can refer to screws or ball bearings.                                                                                                 |                                                                             |                                                                                                                                                       |                                                                        |
| M3x6 Phillips Machine Screw<br> M - metric<br>3 - diameter<br>6 - length |                                                                         | M3x6 Self Tapping Screw<br> M - metric<br>3 - diameter<br>6 - length |                                                                         | M3x10 Socket Cap Screw<br> M - metric<br>3 - diameter<br>6 - length |                                                                             | 3x7 Ball Bearing<br> M - metric<br>3 - inside Ø<br>6 - outside Ø |                                                                        |

## Recommended Tools & Accessories

**The tools and materials listed below are the minimum needed to build the helicopter:**

Screwdrivers - Slotted and Phillips head.  
Long-Nosed Pliers.  
Allen Wrenches - 1.5 to 5.0mm  
Appropriate Socket Wrench - Spark Plug  
Hobby Scissors  
Double Sided Foam Tape ( 1/16" - 3/32" )  
Foam Rubber ( radio packing )  
JB Weld ( bond clutch lining )  
Locktight 260 Green, 242 Removeable & 262 Permanent  
Hobby Grease ( Super Lube )  
Oil to lubricate sliding shafts (Triflow)  
Tygon Fuel Line 1/8" ID - Z231 (3 feet)  
Tygon Fuel Line 3/32" ID -Z260 (3 feet)

**In addition, the following will make assembly and setup easier, and prove useful later in your model toolbox:**

|                |                                   |
|----------------|-----------------------------------|
| Part#CN2015    | Hardened Tip Hex Screw Driver Set |
| Part#CN2026    | Pitch Gauge with Paddle Gauge     |
| Part#CN2034A   | 15° Curve Tip Ball link Pliers    |
| Part#CN2052    | Main Blade Balancer               |
| Part#CN2293    | Fan Hub Puller                    |
| Part#CN2055    | Ball Link Sizing Tool             |
| Part#CN2070    | Universal Flybar Lock             |
| Part#CN2219    | Ball Link Easy Driver             |
| Part#CN2255    | Control Rod Gauge                 |
| Part#CNWI26555 | 5.5mm Nut Driver                  |
| Strap Wrenches |                                   |
| Torque Wrench  |                                   |

## Step 1 Rotor Head Block

The entire rotor head comes pre-assembled with the standard HI6181A (red) head dampers installed. 3D and aerobatic pilots should disassemble the rotorhead and install the hard HI6181B (black) head dampers. Press in the head dampers into the rotor head block. Lubricate the inside surface of each damper with light oil. Leave the M2.5 screws loose.

#HI6181A  
Head Dampers Standard (Red) x 2  
Sport & Scale Flying

#HI6181B  
Head Dampers Hard (Black) x 2  
3D Flying

#HI6160  
Rotor Head Block  
& M2.5x8 Socket Screw x 2

## Step 2 Seesaw Assembly

Insert one ball bearing into each bearing cup and insert into the offset plate. Apply one small drop of slow cyanoacrylate glue (Slow CA) to the joint between the backside of the bearing cup and the offset plate. Insert one ball bearing into each tie bar, using an available M3 socket cap screw form threads into both ends of the tie bars. Insert one M3x6 button head screw through the right side hole of the offset plate (see photo) and thread into one tie bar. Make two identical sub-assemblies. Note that the bearing cups face outwards from the head block. Insert one M3x15 button head screw through the tie bar bearing, slide one steel spacer and carefully apply L242 Blue threadlock to the exposed threads and insert into the right side of the head block. Do not over-tighten. Repeat for the second sub-assembly. Once complete apply a small amount of slow cyanoacrylate glue and insert one HI6167 special long thread ball into each offset plate to complete the assembly.

Completed rotor head.

Bond bearing cup holder to metal offset plate.

#HI3167F  
Bearing Cups x 2

#HI3167B Offset  
Plates x 2

#HI3167G  
Tie Bars &  
Spacers

  
M3x15 Button  
Head Screw  
#HW6001

#CNBB37  
M3x7 Ball  
Bearing x 2

 **Tip 4**  
#HI6167  
Special Ball x 2  
Steel Ball on Left side.

**Tip 4**  
#HW6001  
M3x6 Button  
Head Screw x 2

#CNBB48  
M4x8 Ball  
Bearing x 2

## Step 3 Head Button - Gas SE

Bond the M3 threaded stud into the head button using L262 Red threadlock then apply more threadlock to the exposed threads and thread into the top of the rotor head block. Remove any extra threadlock compound.

Gas SE only

M3 Threaded Stud

#CN2215A  
Machined Head  
Button

Step 4 Bell Mixer

Press one M3x7 flanged ball bearing into one side followed by one M3x5 spacer and another flanged bearing from the opposite side. If the bearing is tight, lightly sand the bell mixer and use L262 Red threadlock to bond the bearing in place. Install the CNLR1014 short steel ball into the single hole side of the bell mixer and install the CNLR1020 medium steel ball using L242 Blue threadlock. Install the medium steel ball according to the table to suit your flying preference. Use the center hole for sport flying. Make two assemblies.

#HW6205  
M3x5x3 Steel  
Spacer x 2

#HI6189  
Bell Mixing  
Arm

#CNLR1020  
Medium Ball

#CNLR1014  
Short Ball

#CNBB37F  
M3x7 Flange Ball  
Bearing x 2

#HW6001  
M3x18 Special  
Shoulder Bolt

L262  
Red

L242  
Blue

| Bell Mixer Ratios |   |       |             |
|-------------------|---|-------|-------------|
| ● ○ ○             | ● | 1:1.6 | 3D          |
| ○ ● ○             | ● | 1:1.3 | 3D & Sport  |
| ○ ○ ●             | ● | 1:1   | Sport & FAI |

x2

Step 5 Main Blade Grip

#CNBB816  
M8x16 Ball  
Bearing

#HI6184  
Main Blade  
Grip

#HW6183  
M14 Thrust  
Washer

x2

Press one M8x16 ball bearing into both ends of each main rotor blade grip. Slide one M14 thrust washer against the bearing closest to the main rotor blade. Make sure that the bearing and the thrust washer are properly seated into the deep end of the blade grip. If necessary use a socket that matches the outside diameter of the bearing and press into position. Make two assemblies.

Step 6 Main Blade Grip Assembly

Using an available M3 screw, carefully form the threads in the blade grip arm. Slide the M3x18 special socket shoulder screw through the bell mixer arm from the flat side, add one M3x5x3 spacer and apply a drop of Slow Cyanoacrylate glue or Epoxy glue to the end of the threads before installing into the blade grip. Tighten the bolt until there is no end to end movement, but do not overtighten the bolt as you can strip out the hole. Make two assemblies.

Bell Mixer  
Assembly

#CNLR1014  
Short Ball

#CNLR1020  
Medium Ball

#HW6205  
M3x5x3  
Spacer

M3x18 Special Socket  
Shoulder Screw  
#HW6001

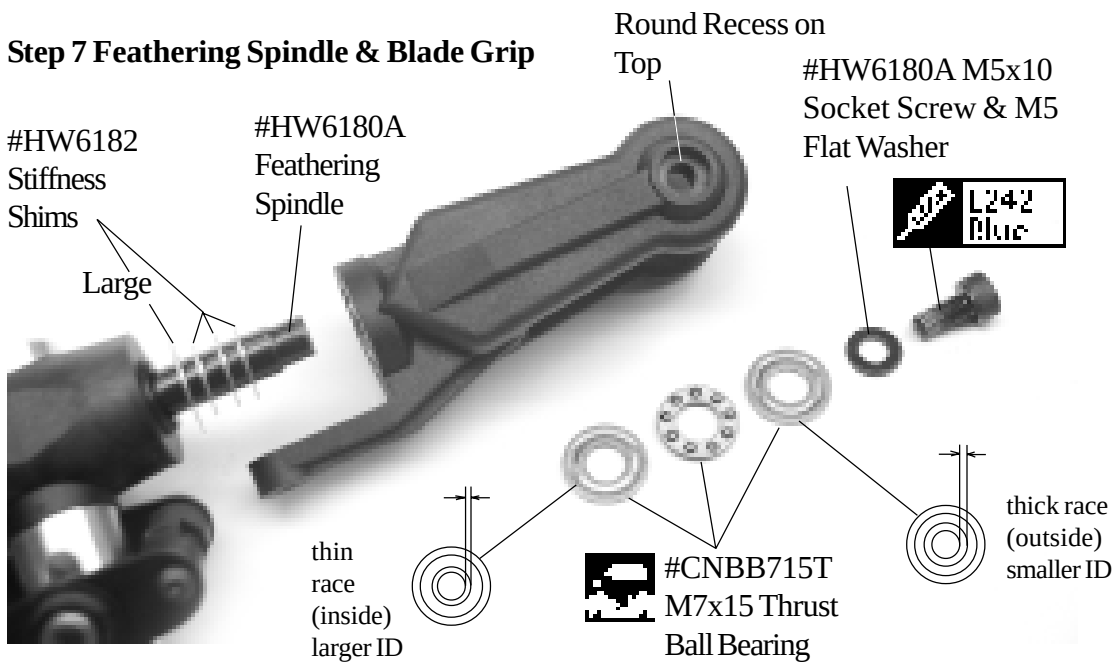
Tip 4

x2

Blade Grip assembly  
from Step 5

Slow cyanoacrylate  
or Epoxy glue

## Step 7 Feathering Spindle & Blade Grip



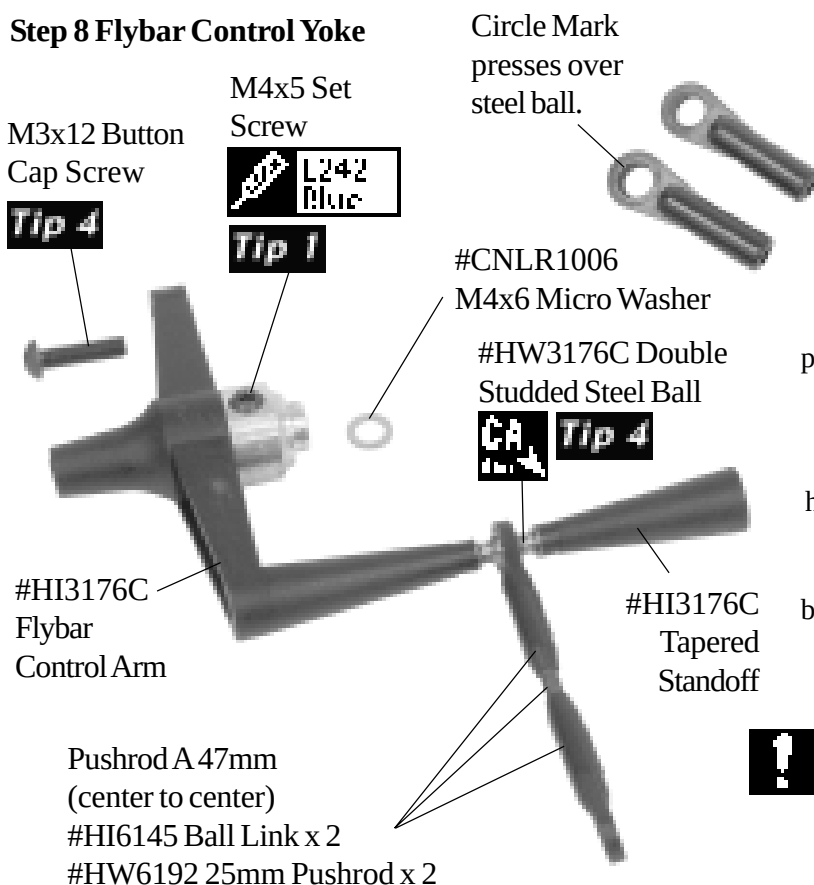
**Tip**

### Hobby Grease

Generally, grease is needed for thrust bearings and the tail rotor gears. A light Lithium or Silicon grease should be used, commonly found at hobbyshops for RC cars.

Remove one damper and press the feathering spindle to seat the ball near the center of the rotor hub. Reposition the rubber damper in the rotor hub and slide one large shim against the damper followed by three regular stiffness shims and one blade grip assembly onto the feathering spindle. The bell mixer and pitch arm of the blade grip is mounted on the leading edge when as the head rotates clockwise. Install the M7x15 thrust bearing and lubricate the bearings with light grease. Looking at the two steel races of the thrust bearing, note that the innermost surfaces have different widths because the inside diameters are different. Slide the first larger diameter steel washer (thin race, larger ID) followed by the greased ball race, followed by the second steel washer (thick race, smaller ID). Remove any grease that may have transferred to the threads using a cotton swab dipped in alcohol. Apply L242 Blue threadlock to the inside threads on the feathering spindle using a pin and install the M5x10 socket cap screw with washer. Do not overtighten this bolt because it will flair the end of the spindle making removal of the blade grip nearly impossible. Repeat for the other blade grip.

## Step 8 Flybar Control Yoke



### Ball Link Direction

All ball links are molded to be installed in only one direction. Look carefully at the hole for the ball, one side is clean while the other side has a circular mark, 1mm larger than the hole. The marked side presses over the steel control balls.

Pushrod A is already assembled but check that the length is actually 47mm (center to center). As the pushrods are built and installed they should be checked for tightness. Press one ball link onto each double studded steel ball, making sure that pressure is applied from the side of the ball link with circle mark. While holding one flybar control arm, apply a small amount of slow cyanoacrylate glue and thread one end of the double studded steel ball into each standoff. When it becomes difficult to turn with fingers, apply slow CA to the threads and start screwing in the tapered control arm stand-off on the other end of the ball.



A correctly installed the ball link should rotate with some resistance when the metal pushrod is rotated in your fingers. If the ball link is too tight the preferred solution is to purchase Century's ball link sizing tool [CN2055] to custom fit each ball link to its steel ball.

## Step 9 Flybar & Flybar Paddles

Note: Bell Mixer positioned on leading edge as head rotates clockwise.

Pushrod B  
26mm (center to center)  
#HI6145 Short Ball Link x 2  
#HW6192 14mm Pushrod x 2

M3x12 Button Head Screw

M4x5 Set Screw



Tip 1

#HW6173 Flybar 520mm  
\*packed with tailboom.

|         |            |       |        |
|---------|------------|-------|--------|
| HI6179  | 20gr 3D    | Grey  | Gas SE |
| HI6179A | 30gr Sport | Black | Gas    |

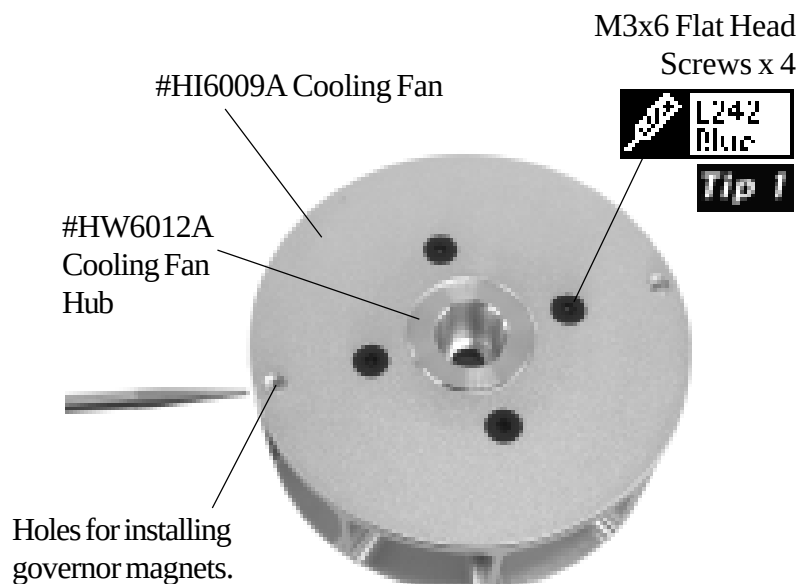
Slide and center the flybar through the head assembly. Carefully look at the flybar control arm assemblies from the previous step and notice that when installed correctly, the securing set screw is on top. Insert one M4x6x0.5 micro washer #CNLR1006 against each bearing then slide the control arm halves onto each side, so that they match together and the set screw remains on top. Insert one M3x12 button head socket screw to secure the opposite standoff, hold the tapered standoff using pliers while tightening the screw (to avoid the double studded ball from stripping the plastic threads in the center). Loosely tighten the M4x5 set screws into the round aluminum inserts aligned with the flat spots on the flybar. Using a ruler, check the distance between the end of the flybar and the control arm and adjust until the lengths are the same. Tighten both set screws, one at a time using L242 Blue threadlock. Make a pencil mark 5mm past the threads on both ends of the flybar. Thread the flybar paddles onto the flybar until the mark is reached, align the paddles parallel. Again using the ruler, rotate one paddle or the other to get equal distances, remember leading edge of the paddles turn clockwise.

Set the length of pushrod B to 26mm (center to center) and attach to the ball on the adjustable side of the bell mixer and to the steel ball on the lower seesaw assembly. Check the ball links for proper fit, adjusting if necessary and remember that the bell mixer is positioned on the leading edge as the rotor head rotates clockwise.

## Step 10 Cooling Fan

The cooling fan hub and fan comes assembled but requires final assembly. Remove each of the M3x6 flat head screws one at a time, apply L242 Blue threadlock and tighten back into the cooling fan hub.

If a governor is planned to be installed, install magnets into the holes provided in the bottom of the cooling fan. A similar hole has been made in the cooling fan shroud mount plate to mount the sensor on the right side (muffler side) of the engine.



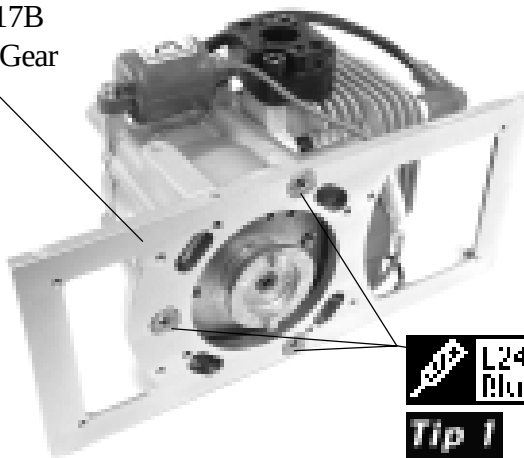
## Step 11 Gas Engine Preparation

Remove and keep the four M4x14 Phillips head screws to remove the pull start unit from the factory mount plate. Similarly remove the factory pull start plate and also keep the M5x14 flat head screws. The screw will be reused to mount the engine and pull start unit to the helicopter.

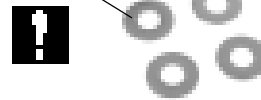
Care must be taken in removing the M5 flat head screws from the engine because they are very tight. Use the T-handle Phillips screwdriver tool that is included with the engine, as this is the correct size.



#HW6117B  
Landing Gear  
Frame



#HW6207  
M6x13x0.2 Shims x 4



M5x14 Counter-  
sunk Phillips  
Screws x 3  
(with engine)



## Step 12 Landing Gear Frame

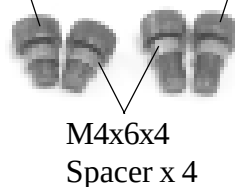
Align the engine crankcase to the landing gear frame and carefully route the red coil wire above the coil without putting a strain on the wire. Insert three M5x15 countersunk Phillips screws using L242 Blue threadlock. On some helicopters, the clutch will sit slightly below the bottom of the clutchbell. If needed, insert three shims between the engine and the landing gear frame.

## Step 13 Removeable Pull Start Mount & Hardware - Gas SE

Install the spacers onto the M4 socket bolts. Install two M4x6 socket bolts with spacers to the rearmost holes using L242 Blue threadlock. These only hold the plate while starting, do not overtighten. Install the M4x10 socket bolts with spacers to the forwardmost holes using threadlock. Using the original M4x14 Phillips bolts, insert the screws through the removable plate with the larger end of the keyholes in the counter clockwise direction. Mate the pull start unit from the other side with the handle down and rearward and secure with four M4 locknuts. This will position the handle on the carburetor side with space to pull freely.

M4x6 Socket Cap  
Screw x 2

M4x10 Socket  
Cap Screw x 2



M4x10 Socket  
Cap Screw &  
Spacer x 2  
(longer)



M4x14 Phillips  
Machine Screws &  
M4 Locknuts x 4

#HW6117B  
Landing Gear  
Frame

M4x6 Socket  
Cap Screw &  
Spacer x 2  
(shorter)



HW6118A  
Removeable Pull Start Plate &  
M4 Locknut x 4

Observe  
correct  
direction!

Gas SE only

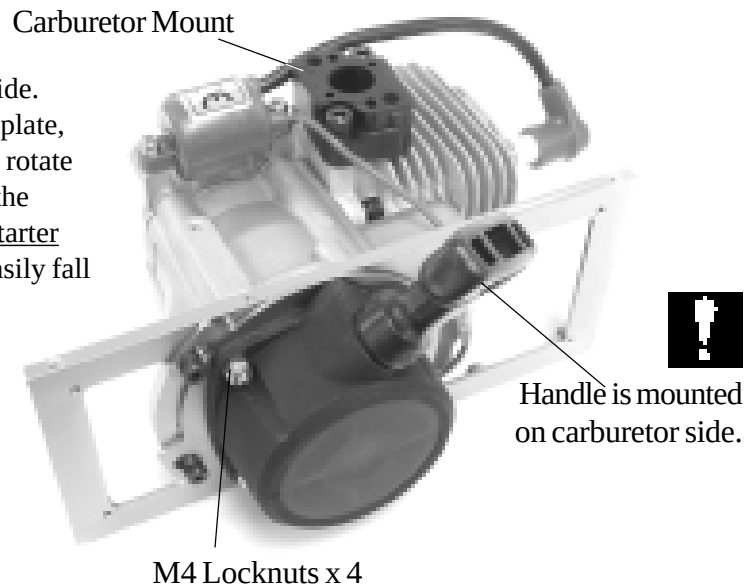
## Step 14 Removeable Pull Start Plate

Note that the pull start handle should be on the carburetor side. Align the pull start plate keyholes to the bolts on the bottom plate, press towards the engine and once the two plates are flush, rotate the pull starter unit clockwise until it stops. Removal is just the opposite. When choosing to use the removeable plate, the starter unit must be removed prior to flying the model, as it could easily fall during flight off from vibration.



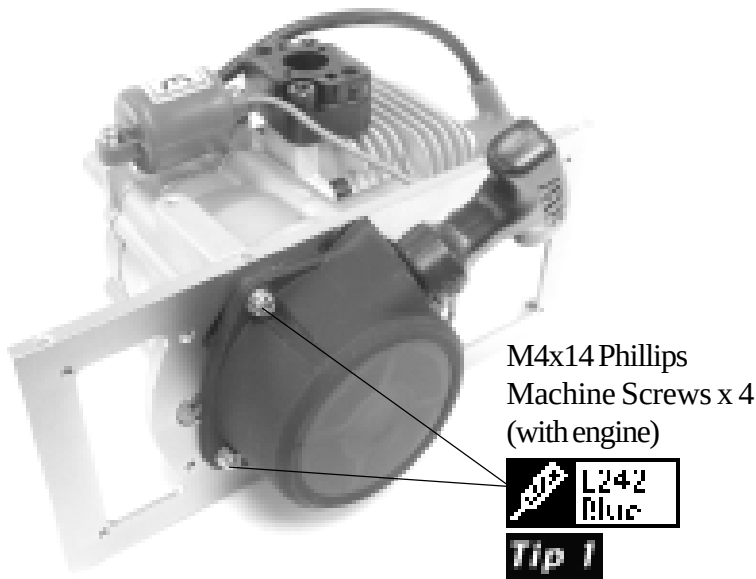
Gas SE only

A greater danger is the potential to generate sufficient RF (radio) noise to cause radio gitching and in certain circumstances will force a PCM reciever into radio lock out, commonly resulting in a crash.



## Step 15 Fixed Pull Start Unit

Look carefully at the bottom plate as there are four M4 threaded holes to the immediate right edge of each oval slot. These are to permanently attach the pull start unit to the bottom plate. Position the pull start unit to have the handle point rearward when the handle is mounted on the carburetor side of the engine. This will allow the handle to be pulled without interference with the landing struts. Attach using four M4x14 Phillips machine screws using L242 Blue threadlock.

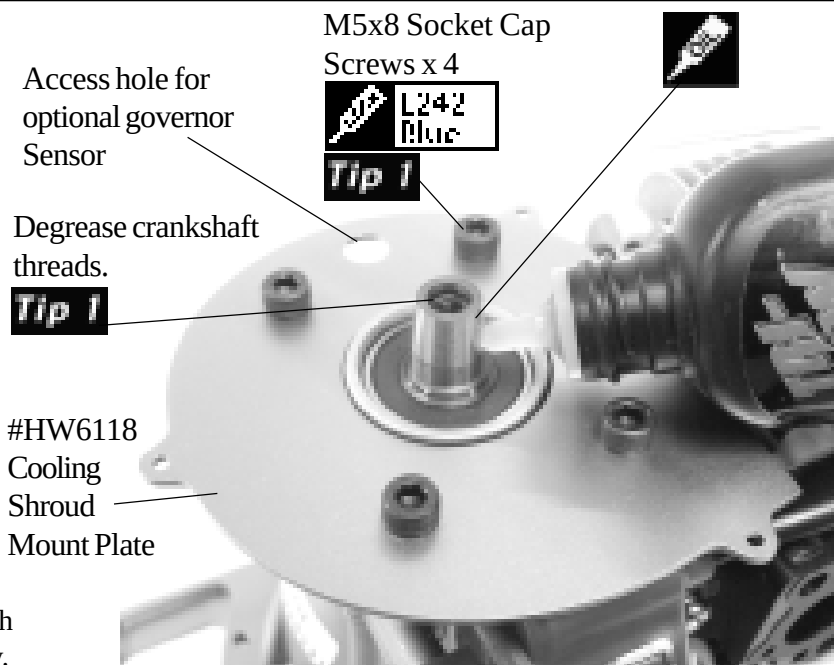


## Step 16 Cooling Fan Shroud Mount Plate

Lay the cooling fan shroud mount plate onto the face of the engine with the straight edge towards the cylinder head and the access hole on the muffler side. Install four M5x8 socket cap screws to secure the plate using L242 Blue threadlock. Do not overtighten these bolts as they thread into the front half of the aluminum cast engine crankcase. Dip a cloth in rubbing alcohol and degrease the threads in the end of the engine crankshaft. Apply liquid oil to the outside taper of the engine crankshaft, the entire taper should be coated. Do not get oil into the internal threads. Use Triflow or equivalent oil.



Overtightening the fan hub in the next step can cause these screw heads to interfere with the fan, these can be shortened if necessary.



## Step 17 Engine Cooling Fan

Slide the cooling fan assembly onto the engine. Locate the M6x15 socket cap screw and M6x13 flat washer and thoroughly clean these parts to remove any oil residue. Install the fan assembly onto the crankshaft. Slide the washer onto the M6x15 socket cap screw install through the center of the fan hub. Using a strap-wrench wrapped around the outside of the cooling fan, tighten the M6x15 socket cap screw until hand tight and check the runout of the fan assembly. Acceptable runout is 0.002", if more, remove the fan assembly and install again. Once satisfied, remove the M6x15 socket cap screw, apply L242 Blue thread lock and secure in place.

M6x15 Socket Cap  
Bolt & M6x13 Flat  
Washer

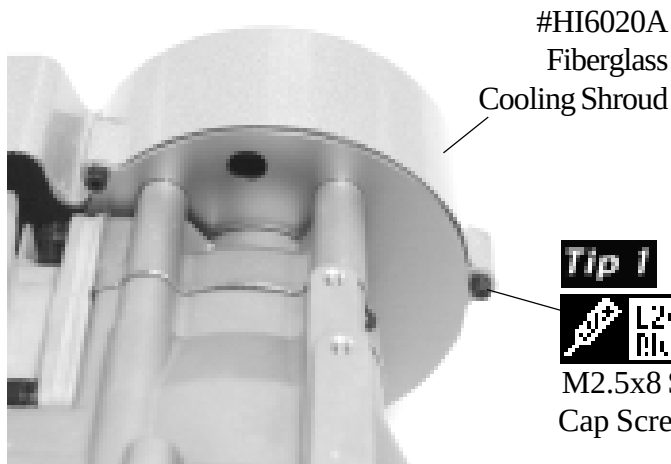
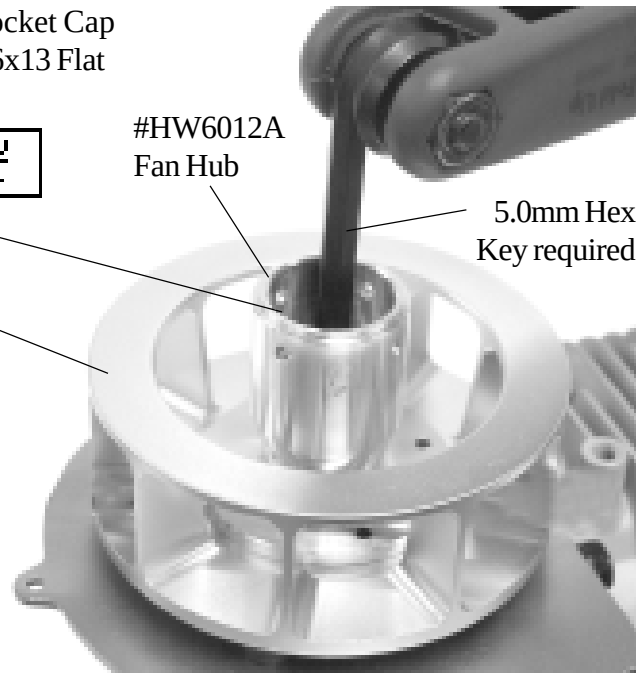


**Tip 1**

#HI6009A  
Cooling Fan

#HW6012A  
Fan Hub

5.0mm Hex  
Key required



#HI6020A  
Fiberglass  
Cooling Shroud

**Tip 1**



M2.5x8 Socket  
Cap Screws x 3

## Step 18 Cooling Fan Shroud

Slide the fan shroud over the cooling fan and secure using three M2.5x8 socket cap screws using L242 Blue threadlock. Tighten these until they stop and that's it, do not torque these bolts!

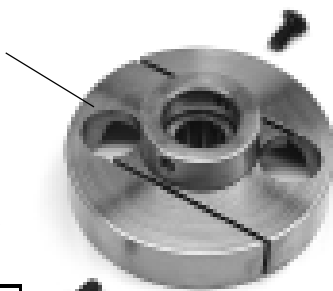
If you plan to install a governor, it is best to fabricate the mount for the sensor at this time, get it fitted and set the sensor gap before the fan shroud is installed.

#HW6011A  
Clutch Shoe

M3x6  
Button Head  
Screws x 4

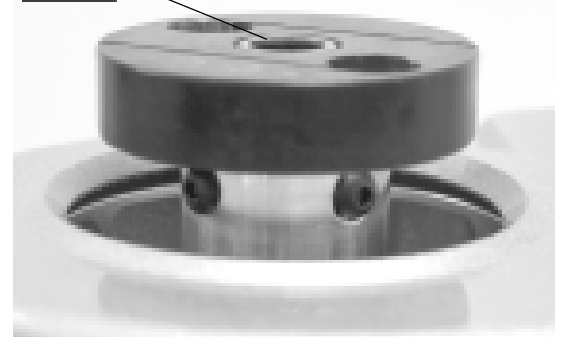


**Tip 1**



Apply light oil to the Torrington bearing in the center of the clutch shoe. Be sure that no grease contacts the edge of the clutch or it could get transferred to the clutchbell. Slide the clutch shoe onto the fan hub, press down and install four M3x6 button head screws using L242 Blue threadlock.

Apply a few drops of  
light oil on the  
Torrington bearing.



## Step 19 Clutch Assembly

**Tip**

Take the time now to make sure that the clutch shoe is properly seated on the fan assembly by looking at it from the side and making sure there is no vertical movement as you slowly turn over the engine. Experience modelers can dial indicate the clutch, the acceptable amount of runout is 0.002"

## Step 20 Rear & X Frame Assembly

Align the rear X frame with the left side of the rear lower frame (notice the spark plug access holes align) for the spark plug wire. Insert one M3x8 socket cap screw from the outside of the lower frame, through the lower hole only in the X frame and secure with an M3 locknut on the inside. Attach the right side lower frame in exactly the same way.

Assemble these bolts only to position the frames at this time, they will be tightened when the upper frames are installed. Note that the upper hole remains empty until that time also.

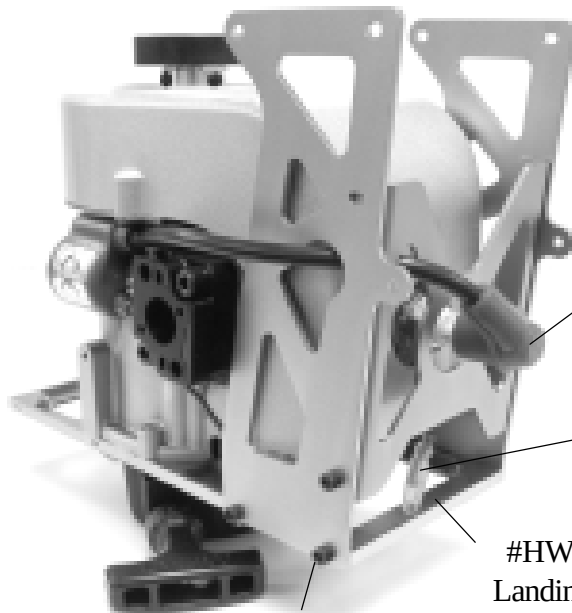
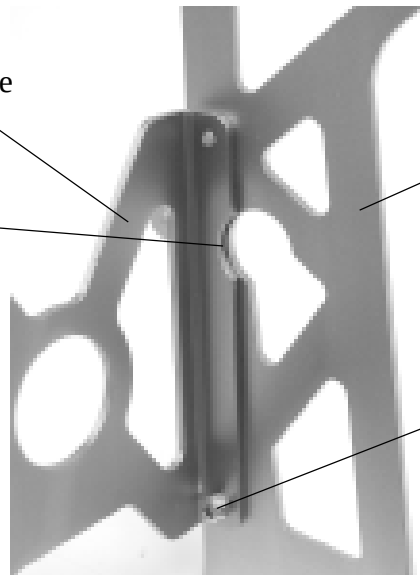
#HW6117A  
Rear X Frame



Align the cutouts.

#HW6115C  
Rear Lower  
Frames - Left  
Side

M3x8 Socket  
Cap Screw &  
M3 Locknut x 2



Spark Plug Wire  
with isolator,  
through the  
frames.

Black coil  
engine lead, not  
used.

#HW6117B  
Landing Gear  
Frame

M3x8 Socket  
Cap Screw x 4

## Step 21 Rear Lower & Bottom Frame

Slide the rear frame assembly over the landing gear frame and insert the spark plug wire through the cutout in the left side frame and the X frame. Insert four M3x8 socket cap screws through the lower frames into the landing gear frame, do not use threadlock at this time. Press the spark plug cap over the spark plug in the engine. Similarly, the M3x8 socket cap screws will not be tightened until after the upper frames are installed.

Attached to the coil is a black wire, this is generally not used in helicopters and should be secured out of the way with a cable tie.

## Step 22 Battery Tray

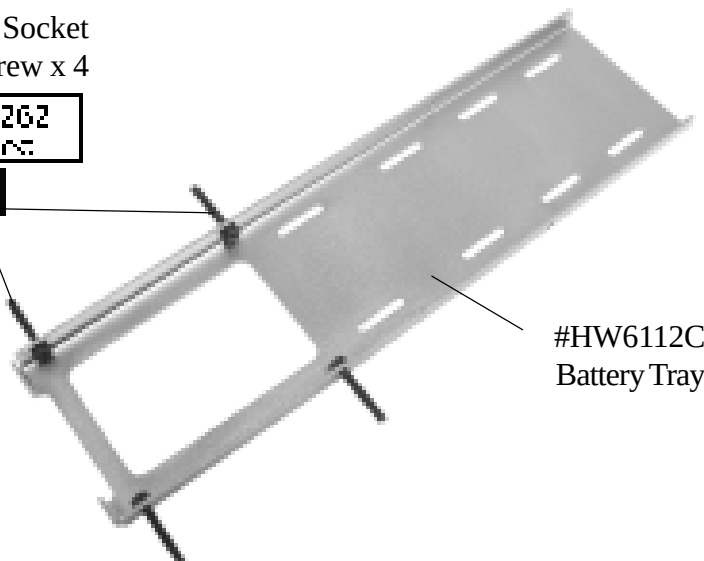
Four M3x20 socket cap screws need to be installed from the inside and threaded through the battery tray. After the fuel tank is installed, there is no access to hold the head of these bolts. We recommend that these bolts be bonded in place using L262 Red threadlock (JB Weld or Slow Cyanoacrylate glue can be used as an alternative) to permanently bond these bolts in place.

M3x20 Socket  
Cap Screw x 4



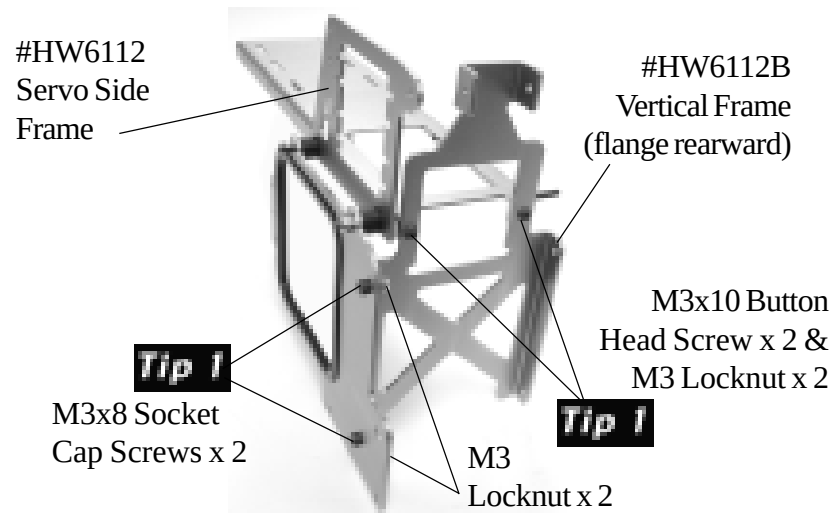
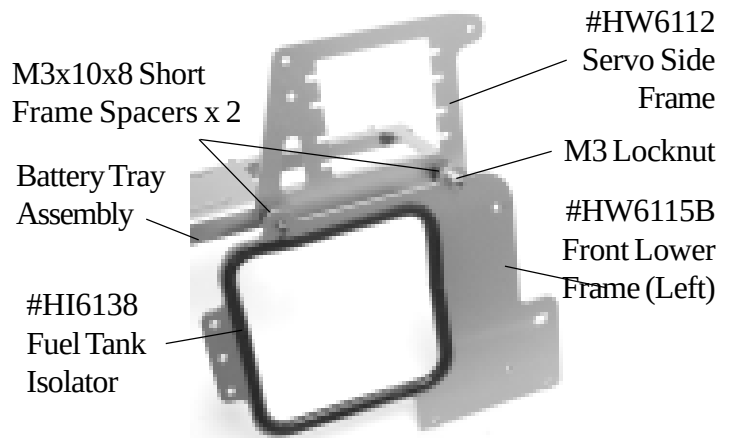
Tip 1

#HW6112C  
Battery Tray



## Step 23 Servo & Front Lower Frame - Left Side

The fuel tank isolators are a “U” profile that need to be fitted to the fuel tank openings on the lower front side frames. Start at the center of one edge and work the isolator into the frame, seating the corners. Towards the end, continue forcing the rubber material until the ends butt against each other. Note that the frames are different sizes and some trimming is necessary. Starting from the left side, slide one of the servo side frames onto the threaded studs on the battery tray, followed by two M3x10x8 spacers and finally the Left (with smaller fuel tank opening) front lower frame. Secure using one M3 locknut at the rearmost stud, do not overtighten as it could loosen the bolt on the battery tray.

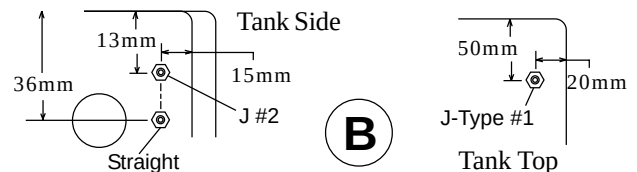
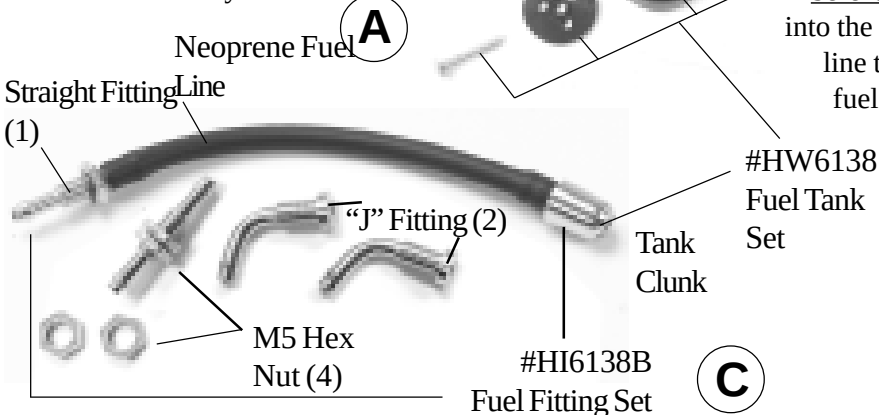


## Step 24 Vertical Frame

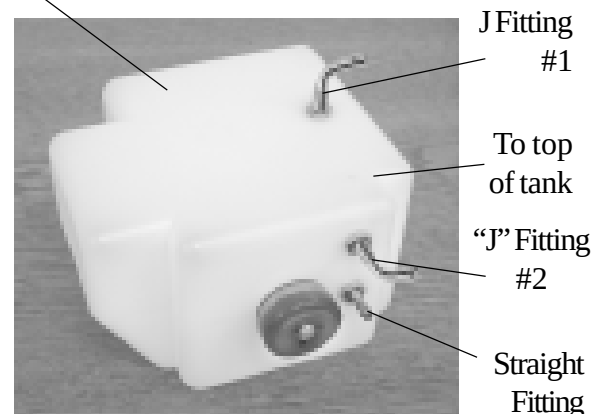
Align the front frame holes to the vertical frame (flange goes rearward) and the upper holes of the vertical frame to the battery tray. Insert two M3x8 socket cap screws from the front lower frame through the vertical frame and secure using two M3 locknuts. Insert two M3x8 button head cap screws (for fan shroud clearance) from the vertical frame side and secure using two M3 locknuts (locknuts need to be held with pliers) from under the battery tray.

## Step 25 Fuel Tank Fittings

Following these dimensions, drill three 5mm holes for the fuel fittings. Using a paper clip, bend the clip to insert the blind fitting accessed through the tank opening and secure with one M5 hex nut using threadlock. Install one M5 hex nut on to the “J” and fitting and secure similarly.



Press the Neoprene fuel line onto the straight fitting before installing into the tank. After securing the fitting into the tank, bend the paper clip into a “J” to pull out the line to attach the clunk. Continue to shorten the inside fuel line until the clunk will move freely front to back and top to bottom.



Insert the M2.5x18 self tapping screw through the large cap, the rubber stopper and the small cap. Continue tightening until the screw is just visible through the small cap and press into the fuel tank. Tighten the screw until the large cap starts to bend and the tank is sealed. Then install the cable tie around the stopper assembly.

## Step 26 Right Front Lower Frames

Starting from the right side of the battery tray, slide the matching servo frame in place first followed by two M3x10x8 spacers. Install the fuel tank with the opening on the left side (the tank only fits one way) and slide the front lower side frame over the exposed threaded studs. Insert two M3x8 socket cap screws through the front side frame and secure with two M3 locknuts on the inside flange of the vertical frame. Install one M3 locknut on the rearmost stud at the back of the battery tray, the front stud remains empty at this time.

M3x10x8 Short  
Frame Spacers x 2

M3 Locknut  
x 2

M3 Locknut

#HW6115B Front  
Lower Frame (Right)

M3x8 Socket  
Cap Screws x 2

**Tip 1**



#HI6138A Fuel  
Tank Spacer &  
M3x8 Socket  
Cap Screw

**Tip 1**



## Step 27 Fuel Tank Spacer

As you will notice the fuel tank will float between the front lower side frames. Install the M3x10x17 fuel tank spacer on the right side frame into the center hole with one M3x8 socket cap screw using L242 Blue threadlock.

## Step 28 Front Frame Assembly

Do not threadlock the frame bolts until the upper frames are installed as it is critical to have the clutch and clutch bell assembly align perfectly. To accomplish the frames can be shifted within the limits of the fasteners.

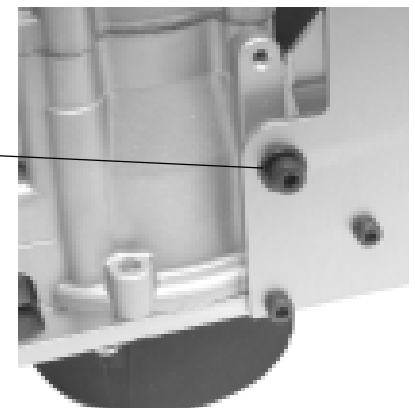
**Tip**

M4x10 Socket  
Cap Screws x 2  
& M4 Flat  
Washer x 2

**Tip 1**

M3x8 Socket  
Cap Screws x 4

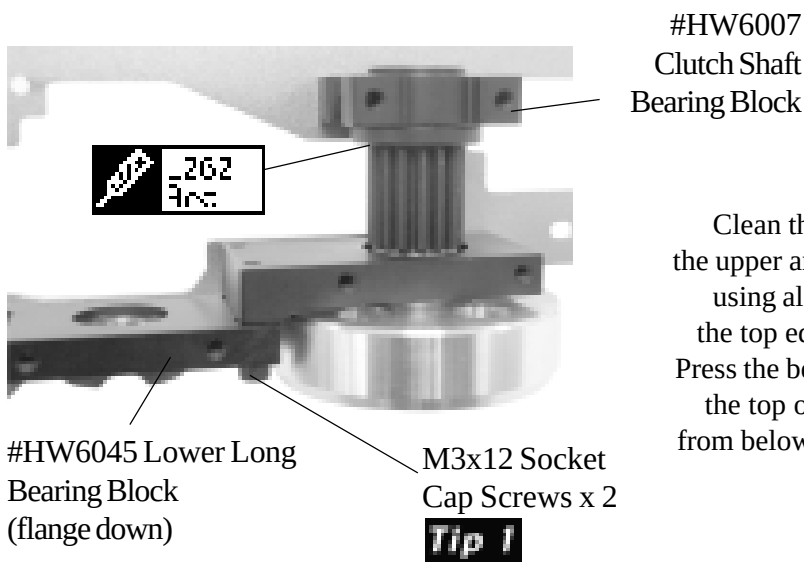
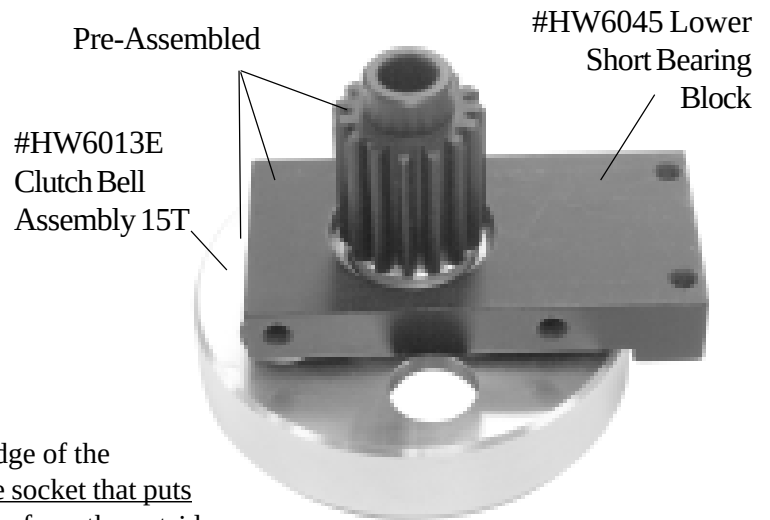
Slide the front frame assembly over the landing gear frame and insert four M3x8 socket cap screws through the lower frames into the landing gear frame, do not use threadlock at this time. Install one M4x10 socket cap screw and M4 flat washer into the slot in the frame, threaded into the side mounts on the engine crankcase. Do not use threadlock until after the upper frames are installed.



## Step 29 Clutch Bell & Short Bearing Block

As the 15T pinion has a larger diameter than the top surface of the clutchbell, it must be removed before the clutch bearing is changed or installed. The pinion has a standard right hand thread, if available use strap-wrenches, grip the outside of the pinion and the clutch bell firmly and turn anti-clockwise. The bearing must be installed into the bearing block before it is installed onto the clutchbell. Clean the inside race of the ball bearing and the surface that where the clutchbell will be installed.

Apply a small amount of L262 Red threadlock to the top edge of the clutchbell and press in place using a thin walled automotive socket that puts pressure only on the inside race of the ball bearing. Pressing from the outside race will damage the bearing which is not covered by warranty. Finally, re-install the pinion being careful not to cross the threads using L242 Blue threadlock.

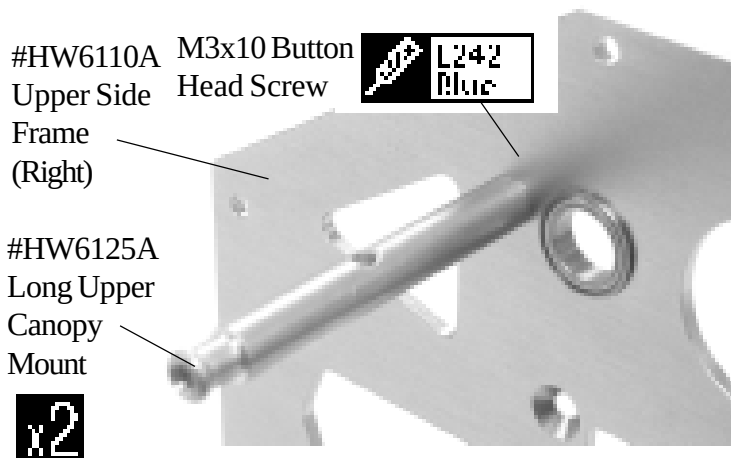


## Step 30 Clutch Shaft & Lower Long Bearing Block

Clean the top of the pinion gear and the inside surfaces of both the upper and lower bearings inside the clutch shaft bearing block using alcohol. Apply a small amount of L262 Red threadlock to the top edge of the clutch gear where it will contact the bearing. Press the bearing block in place, firmly seating the bearing against the top of the pinion gear. Insert two M3x12 socket cap screws from below to attach the long bearing block to the short block. Do not use threadlock until the gear mesh has been set.

## Step 31 Upper Canopy Mount

Looking carefully at the upper frames, the longer canopy mount is installed on the same side as the counter sunk hole above the main gear. Install one M3x8 button head screw from the inside of the frame using L242 Blue threadlock. Repeat for both upper frames.



Gas SE only

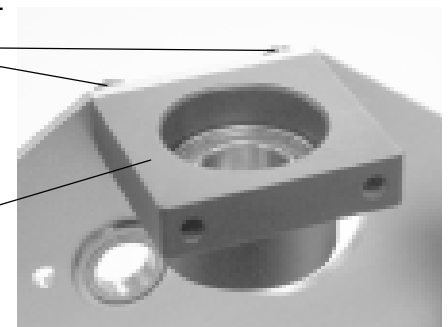
## Step 32 Upper Main Shaft Bearing Block - Gas SE

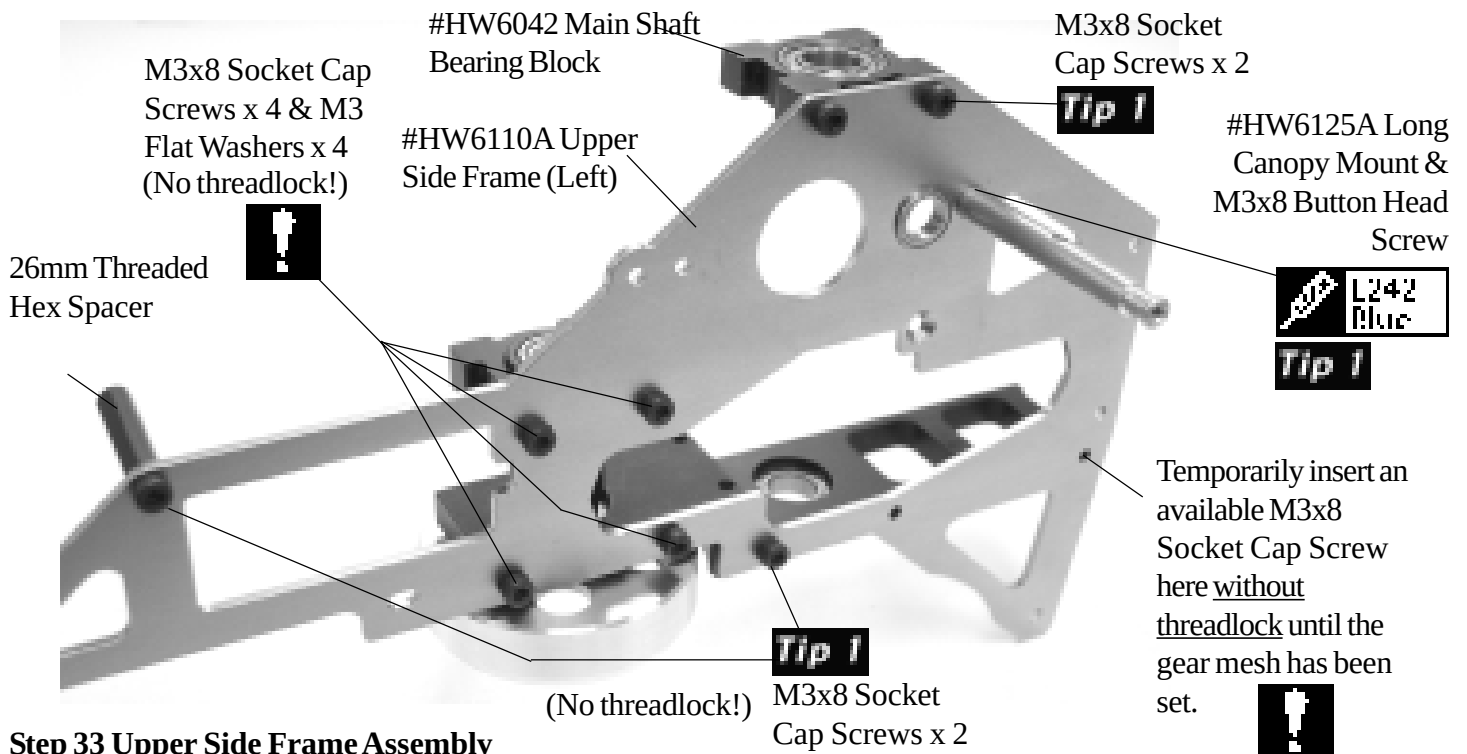
Install the upper main shaft bearing block into the upper holes in the left side of the upper frame using two M3x8 socket cap screws. Do not use threadlock at this time, until after the main shaft is installed.

M3x8 Socket  
Cap Screw x 2

**Tip 1**

#HW6042A  
Triple Bearing  
Block





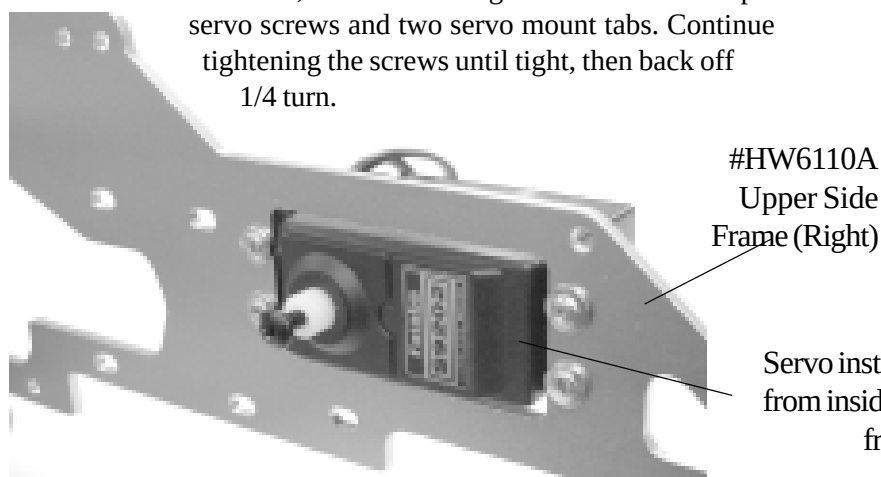
### Step 33 Upper Side Frame Assembly

Install the upper main shaft bearing block with the bearing facing upwards onto the left upper side frame (notice the countersunk hole) using two M3x8 socket cap screws. Install the clutch bell assembly with bearing blocks using four M3x8 socket cap screws and four M3 flat washers. Install one M3x8 socket cap screw only into the forward most hole in the lower bearing block and install the 26mm hex spacer in the front of the upper frames, secured using one M3x8 socket cap screw. Do not use any threadlock on bearing blocks or frame spacers until the gear mesh is set.

**Tip** CCPM (cyclic collective pitch mixing) requires that the three servos that drive the swashplate be the same model and more importantly the same speed and torque rating. Digital and analog servos will fly the Predator with ease as long as the minimum torque rating selected is 70oz/in, rated at 4.8 volts.

### Step 34 Elevator Servo

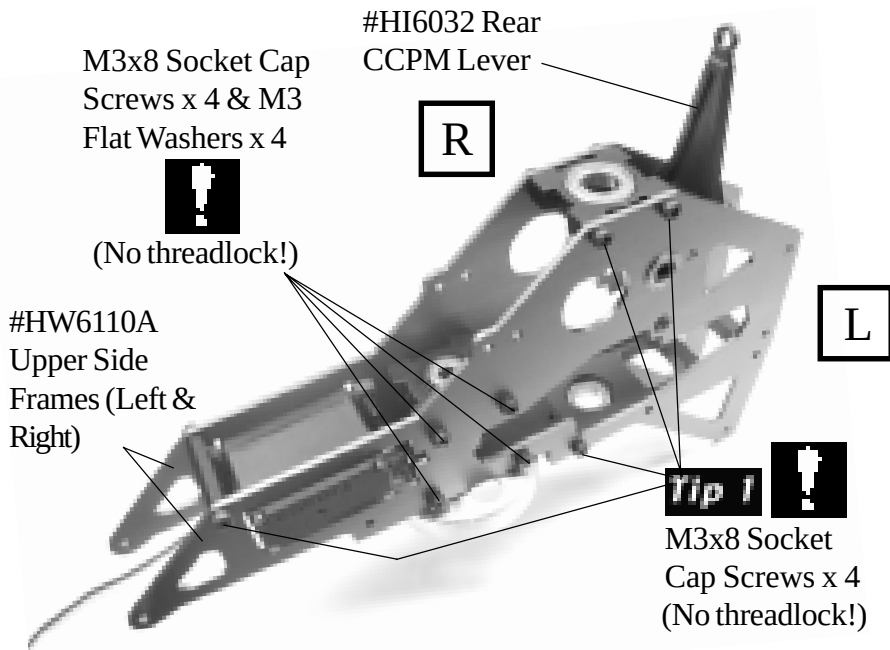
Look at the upper side frame, the remaining right side will have the slots to install the elevator servo. Having previously installed the rubber grommets and eyelets (see on the right), install the elevator servo with its output shaft to the rear from the inside (outside has the countersunk hole above the main gear) of the side frame, and secure using four M2.3x10 Phillips servo screws and two servo mount tabs. Continue tightening the screws until tight, then back off 1/4 turn.



### Servo Grommets & Eyelets

Install the four rubber grommets that are supplied with the servo onto the servo mounts and insert the brass eyelets so that the flat washer side of the eyelet is installed against the side frame. For the elevator servo the eyelets are installed from the top of the servo.

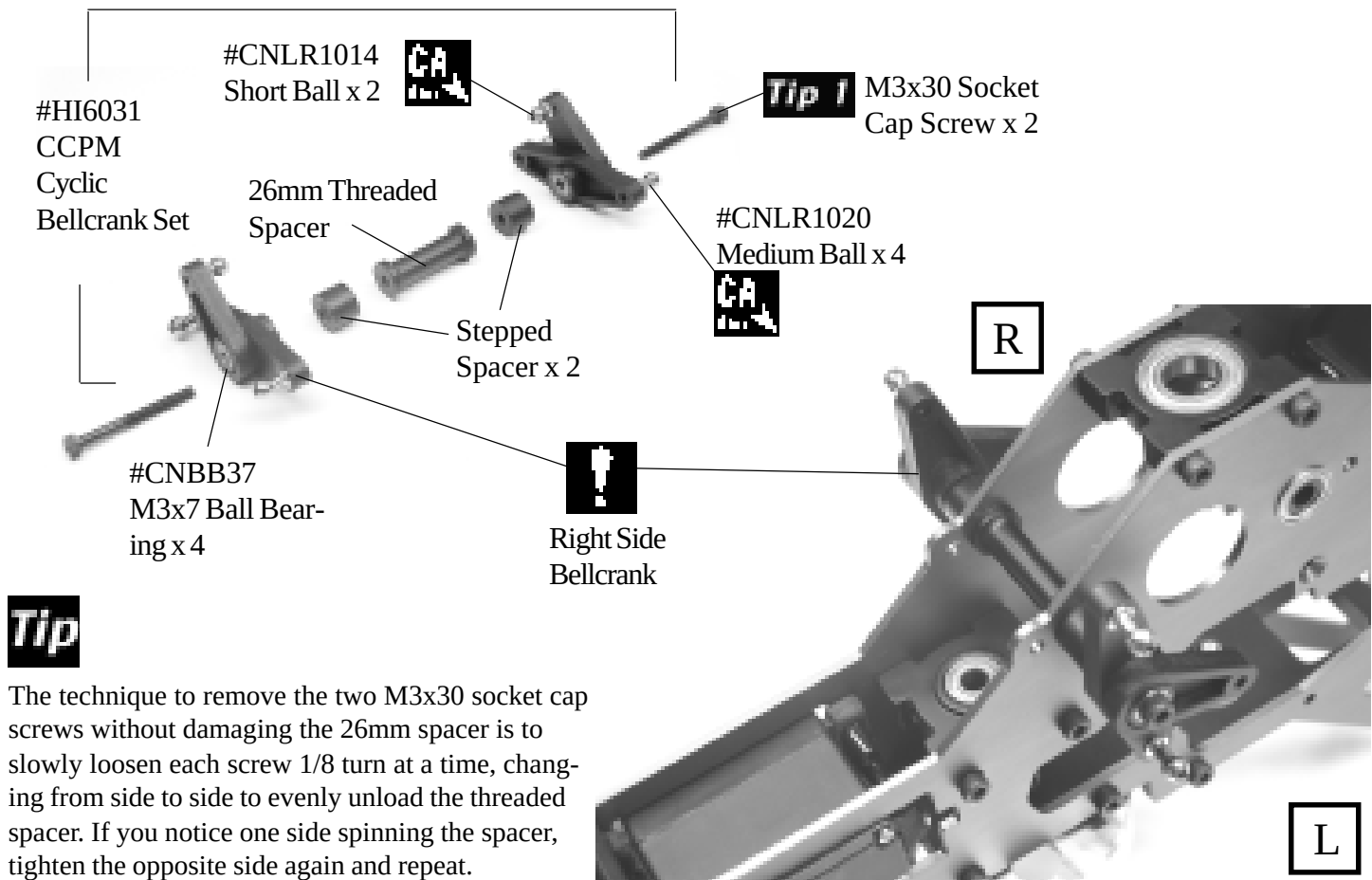
## Step 35 Upper Frame Assembly



Start by installing the elevator bell crank assembly, note that the left side ball bearing is flush with the pivot axle. On the right side frame, the axle extends outward from the frame to attach the elevator arm. Install four M3x8 socket cap screws into the upper main shaft bearing block, front hex spacer and forwardmost lower bearing block. Install four M3x8 socket cap screws into the clutchbell blocks with M3 flat washers. Do not use any threadlock at this time, these need to be loose until the main shaft is installed and after the gear mesh has been set.

## Step 36 Front CCPM Bellcranks

Starting on the right side, insert one M3x30 socket cap screw through the right bellcrank (look at the left photo carefully) on the side with the molded elevator plastic arm. Slide one stepped spacer with the step towards the ball bearing and position the 26mm threaded spacer between the upper side frames in the rearmost hole (120° CCPM setup) and secure the right bellcrank assembly. Assemble the left side bellcrank in the same way, do not apply the threadlock until after the gear mesh has been set and tighten into the left side of the upper frames.



The technique to remove the two M3x30 socket cap screws without damaging the 26mm spacer is to slowly loosen each screw 1/8 turn at a time, changing from side to side to evenly unload the threaded spacer. If you notice one side spinning the spacer, tighten the opposite side again and repeat.

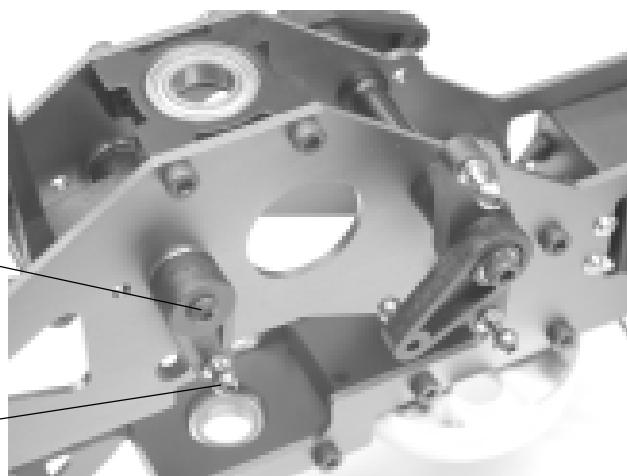
## Step 37 Rear CCPM Arm

Align and press the rear ccpm arm onto the exposed axle with the arm pointing to the bottom of the upper side frames. This is a tight fit, light tapping with a plastic hammer will help here. Once the arm is seated, install the M3x10 button head screw to secure it in place.

M3x10 Button Head Screw

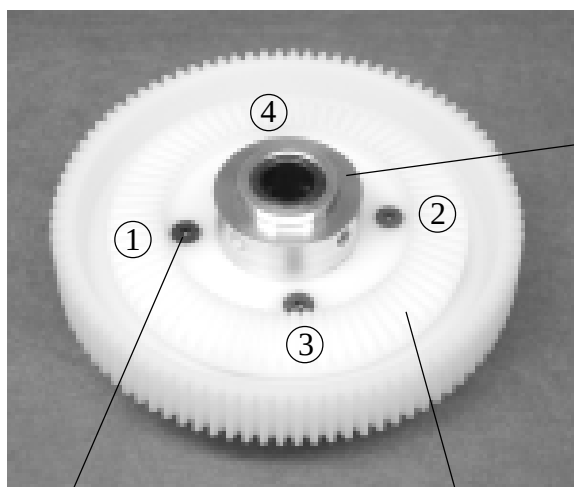
**Tip 4**

#CNLR1014  
Short Steel Ball



## Step 38 Constant Drive Gear Assembly

The constant drive autorotation unit simply slides apart, pull the inner hub assembly up and out from the outer hub. Install the inner tail gear by aligning the four countersunk holes in the top of the inner gear with the auto hub inserted from below using four M3x6 flat head screws and L242 Blue threadlock. Tighten the bolts in numbered order. Assemble the main gear in the same fashion with the main gear installed on top of the autohub, notice there is an alignment groove. Gas SE kits use an M15x18x0.20 shim between the inner and outer hubs.



M3x6 Flat Head  
Screws x 4



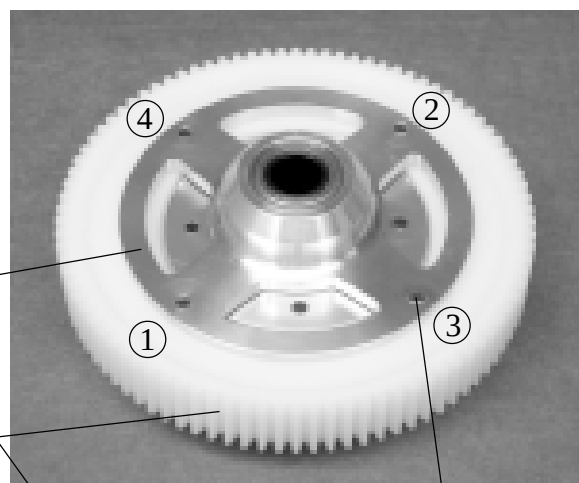
**Tip 1**

#HI6058B Ma-  
chined Inner Gear  
70T - CT Drive

#HI6058M  
Autohub - Inner  
Gear CT Drive

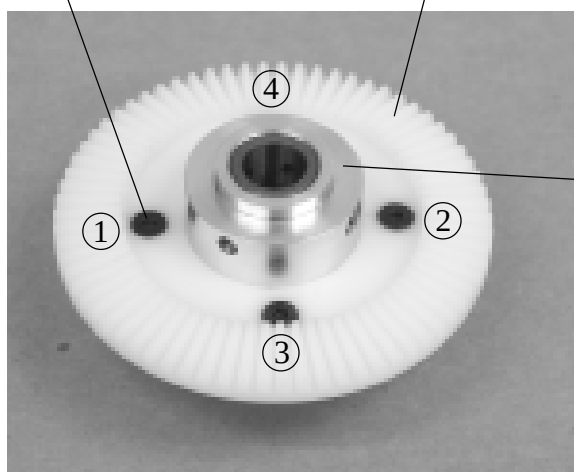
#HI6058N  
Autohub - Outer  
Gear CT Drive

#HI6058H  
Machined Main  
Gear 88T - CT  
Drive



M3x6 Flat Head  
Screws x 4

**Tip 1**

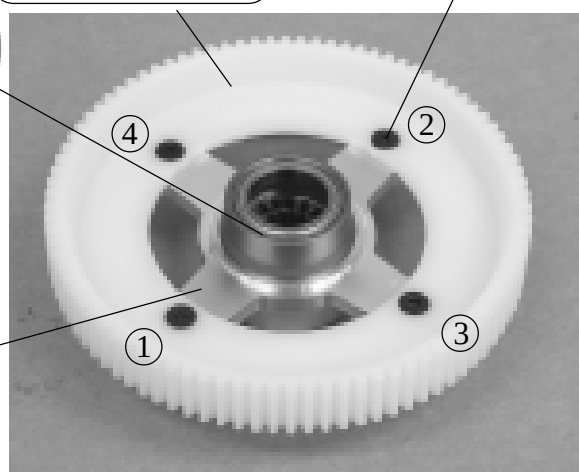


#HI6064D  
M15x18x0.20  
**Sprague**  
Shim

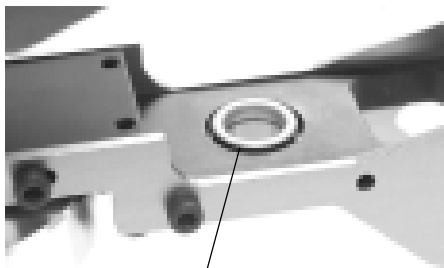
#HI6064A  
Autohub - Inner  
Gear **Sprague** CT  
Drive

#HI6064B  
Autohub - Outer  
Gear **Sprague** CT  
Drive

Gas SE only



### Step 39 Auto Hub Spacer



#HW6054  
M10x14x3.5 Spacer



Do not remove the two set screws that are already installed in the top auto hub, these are factory installed.

### Step 40 Main Gear Pin #HW6001 M3x15 Steel Pin &

M4x4 Set Screws x 2

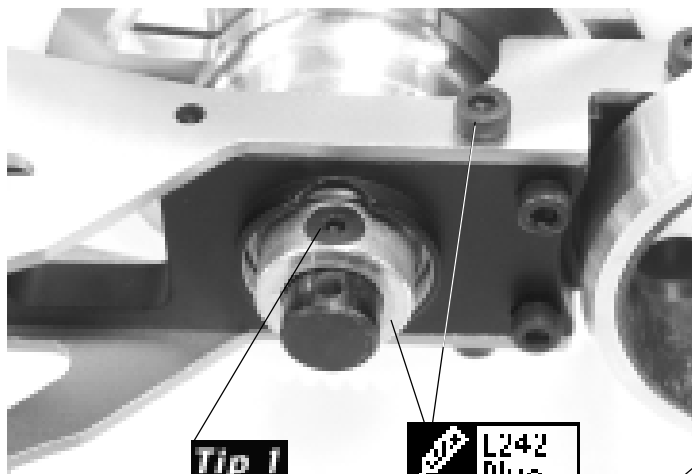


Mark the set screws that secure the pin.

Before the main gear assembly can be installed this spacer must be positioned in the recess of the lower bearing block assembly, it will simply self align in the block. Slide the main shaft through the upper bearing block, the constant drive main gear assembly, the spacer and finally through the lower bearing block assembly. Look carefully through the two open M4 threaded holes in the top hub and align with the hole in the main shaft. Insert and press the M3x15 steel pin through the hub and roughly center it in the main shaft. Using a permanent marker, mark both holes that will lock the pin in place. Insert the M4x4 set screws in each side and tighten them equally, using L242 Blue threadlock. These do not need to be torqued down.

### Step 41 Bottom Collar

Inspect the bottom collar, make sure that the reduced step diameter is towards the ball bearing. Slide the bottom collar against the bearing and insert two M3x6 flat head cap screws using L242 Blue threadlock.



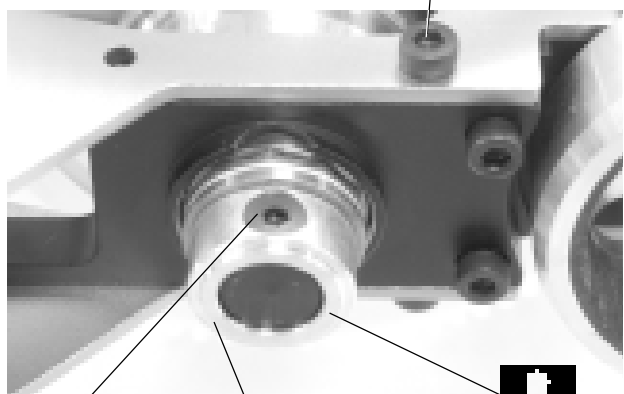
#HW6054 Bottom Collar &  
M3x6 Flat Head Screws x 2



Now that the main shaft is installed, remove the four screws that secure the upper main shaft bearing block and the forwardmost lower bearing block screw and one at a time and apply L242 Blue threadlock and tighten in place.

### Step 42 Bottom Collar - Gas SE

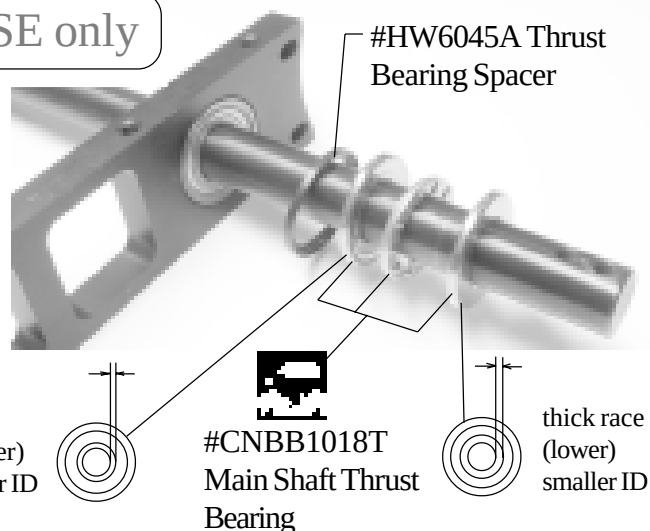
Slide the flat side of the thrust bearing spacer against the bearing, followed by the larger ID race, apply grease to the ball race and and finally the smaller ID race. Slide the bottom collar with the flat side towards the thrust bearing and insert two M3x6 flat head cap screws using L242 Blue threadlock.



#HW6054 Bottom Collar &  
M3x6 Flat Head Screws x 2

Offset step  
away from  
thrust bearing.

Gas SE only



### Step 43 Mast Stopper



If not already done, remove and apply L242 Blue threadlock x 4 and tighten in place.



Start one M2.6x8 socket cap screw into the mast stopper. Slide the mast stopper onto the main shaft, ensure the raised lip is towards the bearing. Pull up on the main shaft to remove any vertical play, press the mast stopper down and tighten in place using L242 Blue threadlock.

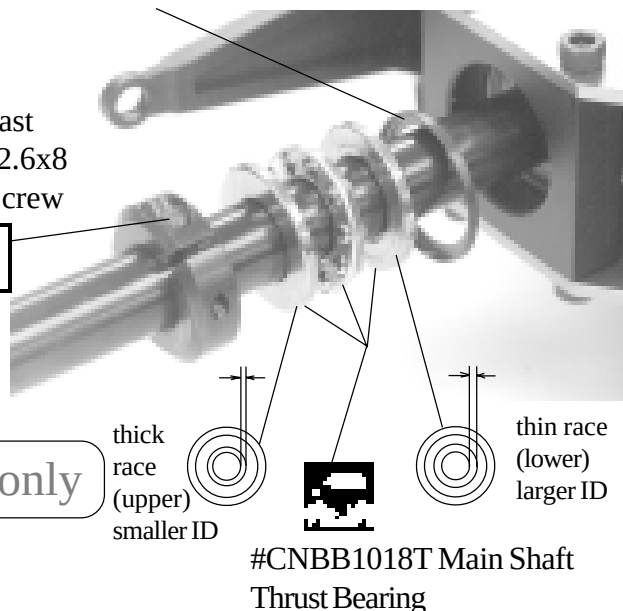
### Step 44 Mast Stopper & Upper Thrust Bearing - Gas SE

If not already done, remove and apply L242 Blue threadlock to the upper main shaft bearing block screws and the forwardmost screw on the lower bearing block. Tighten in place.

The Gas SE includes the triple upper bearing block. Slide the flat side of the thrust bearing spacer against the bearing, followed by the larger ID race, apply grease to the ball race and and finally the smaller ID race. Start the M2.6x8 socket cap screw into the mast stopper. Slide the mast stopper onto the main shaft, ensure the raised lip is towards the bearing. Pull up on the main shaft to remove any vertical play, press the mast stopper down and tighten in place using L242 Blue threadlock.

#HW6045A Thrust Bearing Spacer

#HW6054 Mast Stopper & M2.6x8 Socket Cap Screw



### Step 45 Starting Shaft and Hex Coupler

The gas kits include the regular starting shaft and hex coupler as in all the Predator kits to align the clutch to the clutchbell. Clean both the starting shaft and the inside race of the bearing inside the clutchbell and the inside race of the top starting shaft bearing. Apply a small amount of L262 Red threadlock positioned just above where the bottom clutchbell bearing will sit on the starting shaft. Slide the starting shaft up through the bearing blocks. Apply a small amount of L242 Blue threadlock to the top of the starting shaft and slide the hex coupler in place aligning the flat spot with one of the holes. Apply L242 Blue threadlock to the the two M4x4 set screws and tighten in place.

The hex starting system has been successfully used with the Z231H engine but significant wear on the hex coupler is common. Regular replacement of the hex coupler is normal and is not covered by warranty. The pull start should be used for the first start of the day. Afterwards using a heavy duty electric starter is possible.

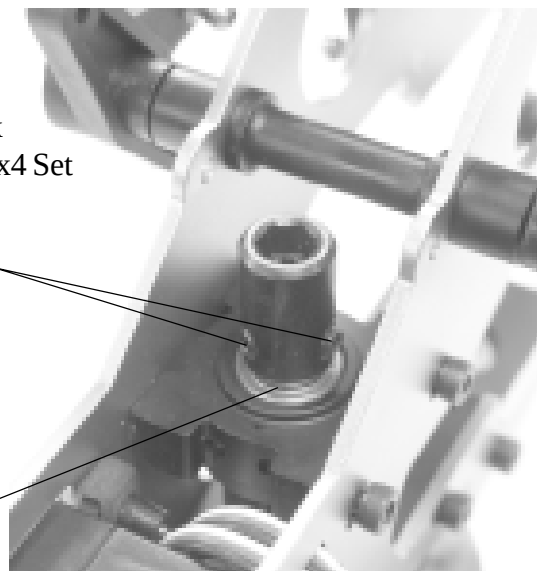


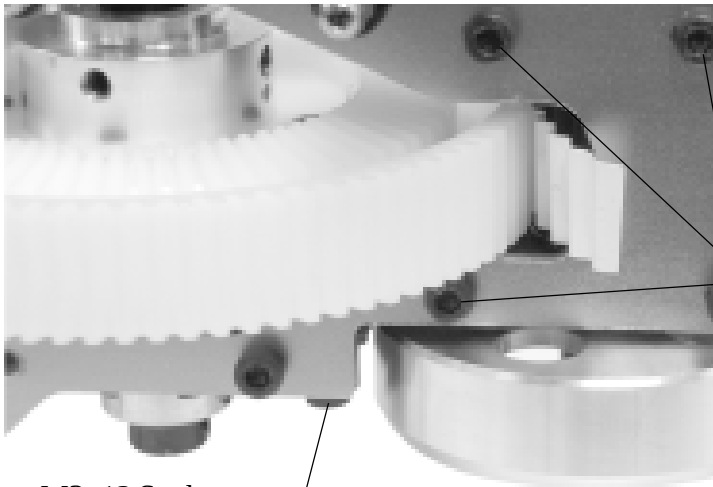
The hex starting is not recommended for the Z260H engine as damage can occur to your starting equipment and helicopter components.

#HW6002 Hex Coupler & M4x4 Set Screws x 2



#HW6005 Starting Shaft





## Step 46 Main Gear & Clutchbell Gear Mesh

M3x8  
Socket Cap  
Screws x 8  
& M3 Flat  
Washers x 8



**Tip 1**

Loosen the eight M3x8 socket cap screws that hold the clutchbell assembly and the two M3x12 socket cap screws between the upper and lower bearing block assemblies. Cut a strip of regular copy paper 12mm x 50mm and thread between the main gear and the clutchbell gear. Press the clutch bell towards the main gear and tighten up the eight bolts. Proper gear mesh is achieved when the paper strip will pass between the gears without ripping or damaging the paper strip, but no looser.

M3x12 Socket  
Cap Screws x 2



**Tip 1**

One at a time, remove each of the M3x8 and M3x12 socket cap screws, apply L242 Blue threadlock and tighten in place. After completion, you should still be able to thread the paper strip through the gears. If not, repeat this procedure.

## #HW6127B Gas Frame Spacer Set

10mm Gas Frame  
Spacers x 10

14mm Servo  
Frame Spacers

X Frame x 2

17mm Rear Frame  
Spacers x 4

26mm Threaded  
Spacers x 2

26mm  
Threaded  
Hex Spacer

22mm Threaded  
Hex Spacer

## Step 47 Frame Spacers

Ensure that the correct spacers are used in the correct locations when assembling the upper and lower frame assemblies.

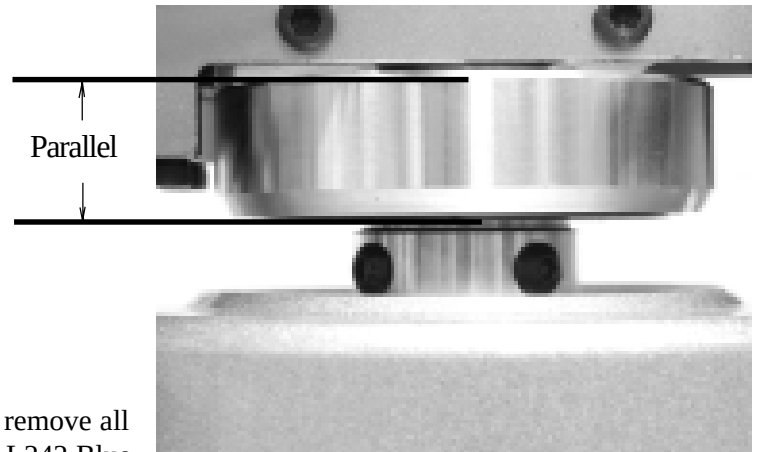
Rear frame  
spacers are  
stacked.

## Step 48 Clutch & Clutchbell Alignment

Over the next few steps the upper and lower frames will be joined. The frames have the necessary slots to allow for precise alignment between the clutch and the clutchbell. The goal is to have the clutch sit parallel and centered in the clutchbell. It is best to sight the bottom edge of the clutch with the aluminum clutchbell in both fore-aft and left-right directions to ensure remains parallel when all the fasteners have been tightened. It may be necessary to further loosen the frame fasteners.

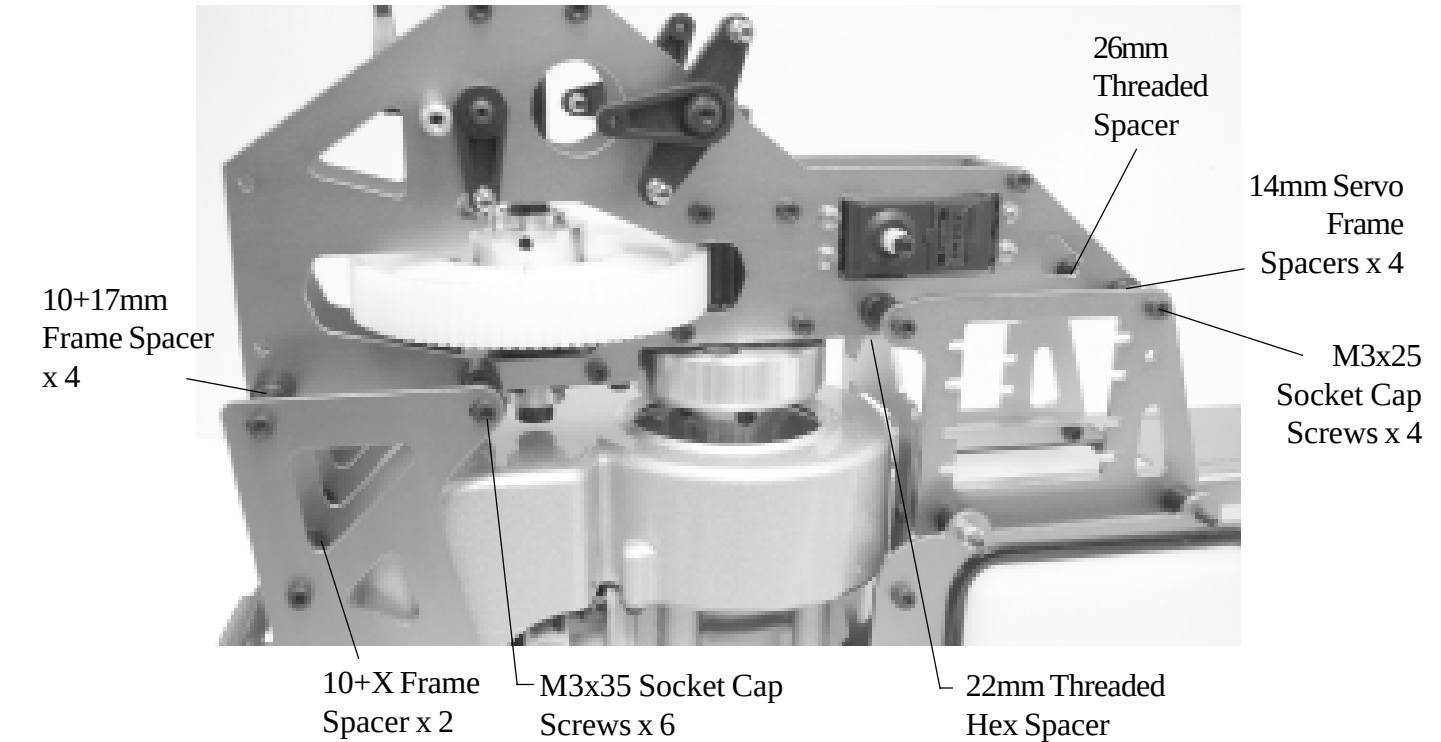


Now that the gear mesh has been set, go back and remove all the upper frame screws one screw at a time, apply L242 Blue threadlock and tighten in place. These include the M3x8 frame screws, M3x30 bellcrank screws and the front hex spacer screws.



Step 49 Upper and Lower Frame Assembly

Position the upper and lower frame assemblies, aligning the starter shaft in the clutch bell to the torrrington bearing in the clutch. While holding this in place, insert the M3x25 socket cap screws on both sides through the servo frames, position the 14mm standoffs and thread into the 26mm round threaded spacer into the forwardmost hole. The 22mm threaded hex spacer must be positioned at the top of the vertical frame and held with pliers while installing the screws. Install the rear M3x35 socket cap screws for each side through the top lower frame holes, position the 17mm frame spacers followed by the 10mm frame spacers and thread into the bearing block between the frames. Insert two M3x35 socket cap screws through the lower holes, through the X frame and position two X frame spacers along with two 10mm spacers, finally threading into one 26mm round threaded frame spacer.



Up to this point we have not used threadlock on any of the fasteners. Take the time now to align the clutch to the clutchbell as accurately as possible. The upper and lower frames have been slotted to allow this adjustment. Once the clutch is parallel to the clutchbell both fore-aft and left-right, test by slowly pulling the starter cord. Watch as the clutch turns to make sure that it does not turn the clutchbell at any point. All the fasteners should be tightened by this point, both the frame spacers and the M3x8 socket cap screws to attach the lower frames to the landing gear frame. Start and remove each of the frame spacer bolts one at a time, apply L242 Blue threadlock and tighten in place. After completion, repeat the test to verify that the clutch is still in perfect alignment. Remember to threadlock the M4 engine bolts also.

Step 50 Pushrod Assembly

Pushrod A & C have been assembled already and are included with the rotor head. These pushrods should be removed and checked against the table and sized if necessary to properly fit the steel balls. Build the remaining pushrods following the table and remember that most of the pushrods will have ball links that attach in opposite directions from each other, check the location of the balls before installing the pushrod and ensure that the length remains the same. \*The throttle pushrod needs to be shorted from 104mm to 94mm taking 5mm off each end to be able to achieve the 112mm length.

Circle Mark presses over steel ball.

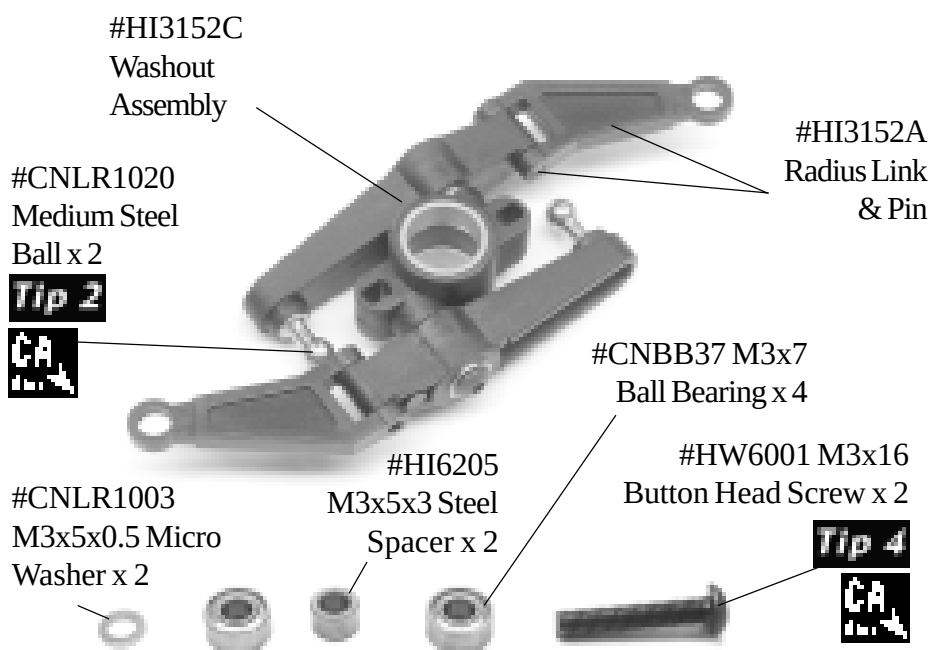
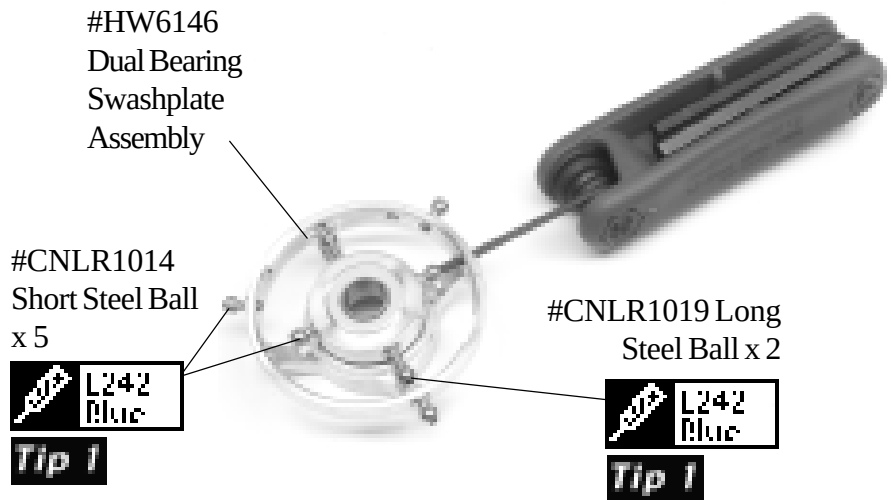
All pushrods are measured center to center.

Ball links install only in one direction.

| Location                     | Pushrod | Rod  | Length |
|------------------------------|---------|------|--------|
| Washout to flybar (2)        | A       | 24   | 47     |
| Bell mixer to seesaw (2)     | B       | 15   | 26     |
| Bell mixer to swashplate (2) | C       | 80   | 99     |
| Front CCPM to servos (4)     | D       | 104  | 120    |
| Elevator arm to servo        | E       | 80   | 100    |
| Throttle arm to servo        | F       | 104* | 112    |
| Front CCPM to swashplate (2) | G       | 35   | 56.5   |

## Step 51 Swashplate

Starting with the inside race, apply L242 Blue threadlock to the two long silver steel balls and attach them across from each other. The balls need to be started by hand at one of the holes in the outer swashplate rim and then tightened with an M2.0 hex key through the same hole. Insert two short steel balls across from each other using L242 Blue threadlock. Install three short steel balls on the outside ring in either the 120° degree (normal) or 140° degree positions using threadlock.

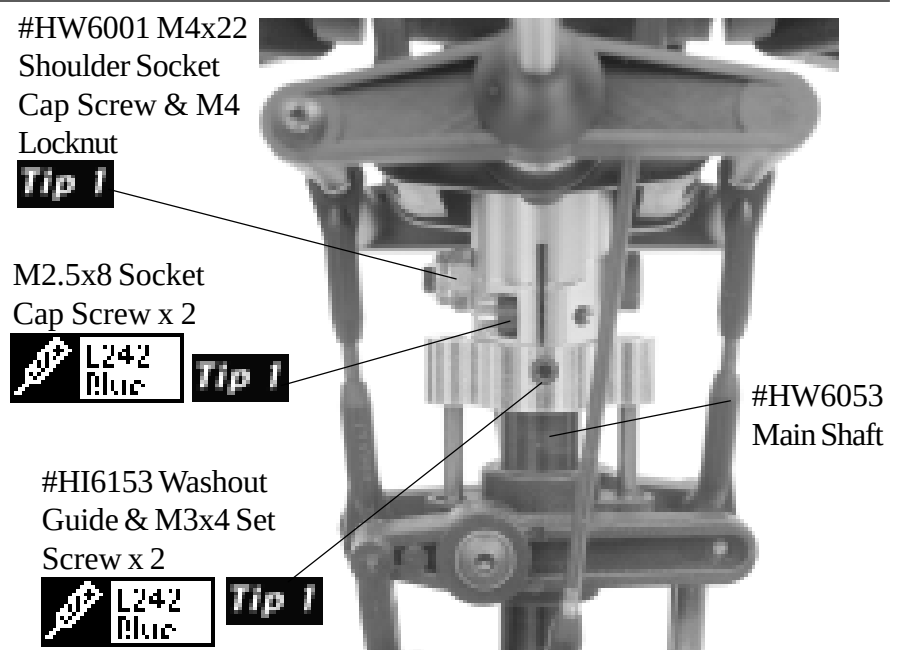


## Step 52 Washout Assembly

Apply a small amount of slow cyanoacrylate (Slo CA) glue. Attach the two medium steel balls to the end of the washout control arms, do not overtighten the balls into the plastic. Press one M3x7 ball bearing into one side followed by one M3x5x3 spacer and the second ball bearing from the other side. Insert one M3x15 button head screw from the hollowed side of the washout arm, slide one M3x5x0.5 micro washer and apply a small amount of Slo CA glue to the exposed threads and thread into the washout hub, again being careful not to overtighten the screw. When correctly assembled the screw is positioned on the left side (see photo) of the main shaft.

## Step 53 Rotorhead Attachment

Slide the swashplate followed by the washout unit (make sure the screw is on the left side of the main shaft), the washout guide and the rotor head onto the main shaft. Insert the M4x22 shoulder socket cap screw through the rotor head hub and main shaft and secure with one M4 locknut, torque down the screw. Apply L242 Blue threadlock to the M2.5x8 socket cap screws and tighten into the bottom of the rotor head block to clamp against the main shaft, do not overtighten. Position the washout guide against the collar and align one hole to the vertical slot in the rotor head. Apply L242 Blue threadlock to the M3x4 set screws and evenly tighten set screws in place.



## Step 54 CCPM Radio Review and Setup

The next section covers setting the pushrods and servos that will control the helicopter. It is important at this time that you review the instructions provided with your radio that control the ccpm mixing for the 3 cyclic servos. Reviewing the radio instructions will assist you in becoming familiar with the functions that affect the individual servos and affect the interaction of the three servos working together to control the swashplate.

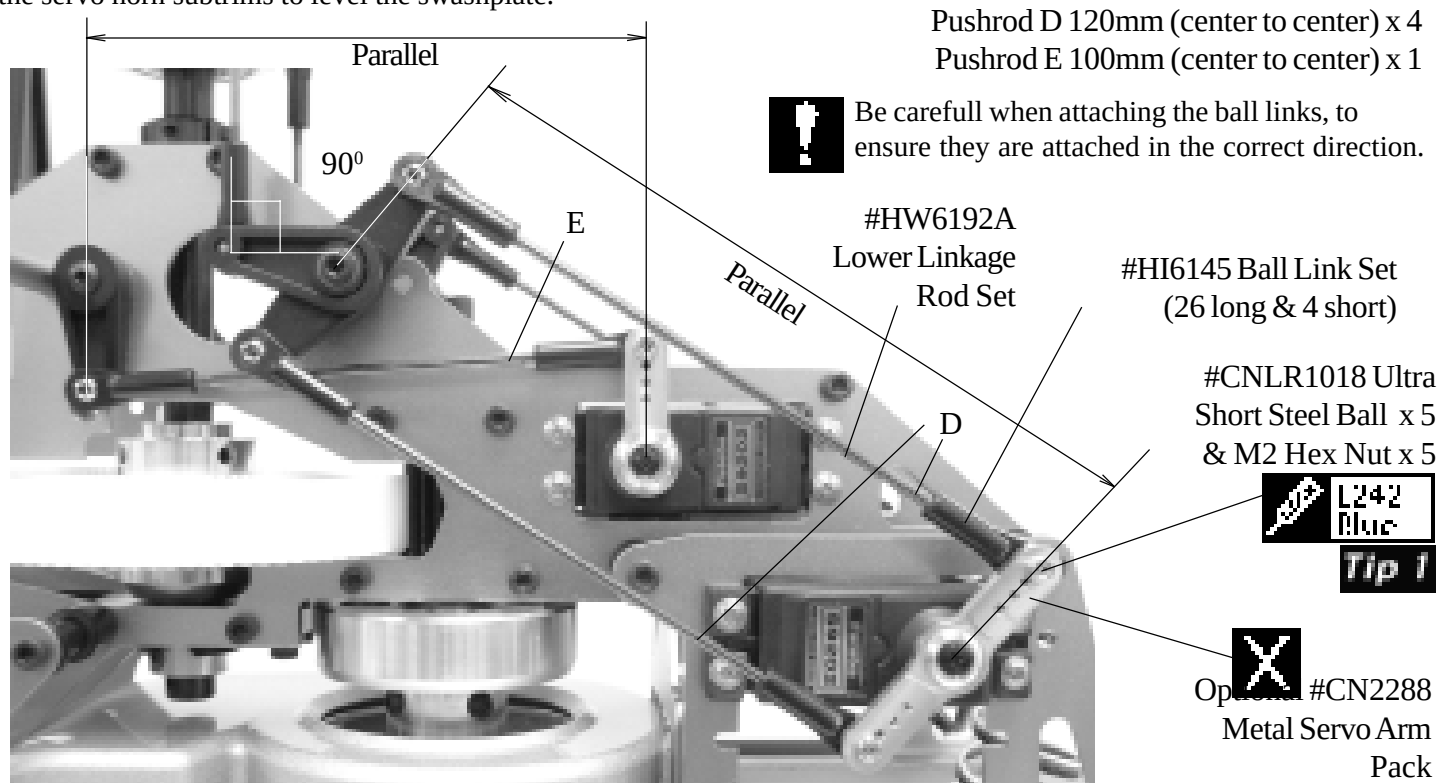
### Radio Setup Procedure

1. It is best to choose a new model memory (if available) and use the Reset feature to remove any previous settings or mixes, remember this usually also returns the radio configuration to single servo.
2. Locate and activate the swashplate mixing for 120° ccpm (most manufacturers set single servo by default).
3. Return both the aileron and elevator subtrims to neutral along with any hover pitch knobs to neutral.
4. Adjust the servo reversing switch to make sure the servos are moving in the correct direction, together as the collective stick is raised. If the servo reversing does not correct the movement of a servo, there is always a travel adjustment function inside the swashplate mixing menu. Change the default setting to be opposite, for example, if set to +60 then change to -60 and change any servos that are affected.
5. After each servo horn is mounted, it is critical that the horn be 90° degrees to the respective pushrod.

The goal in the end after all the servos are mounted is to have the swashplate sit level or at 90° degrees to the main shaft and have the swashplate move equally fore, aft and side to side. The swashplate will also travel up and down as the three servos work together. This will result when the radio setup procedure has been followed and the servo centering for the 3 CCPM servos set very, very accurately to eliminate pitch change when moving the aileron or elevator sticks.

## Step 55 Front and Rear CCPM Pushrod Setup

Before proceeding, the three CCPM servos should be identical in speed and torque. Install the rubber grommets and eyelets from the bottom of the servo tabs. Install the two front CCPM servos from the outside of the servo side frames using eight M2.3x12 Phillips screws from the top of the servo and securing using four plastic servo mount tabs. The tabs need to be held with pliers from the inside of the servo frame. The steel balls installed on the servo horns must be positioned at a 20mm radius from the center of the servo. Install two ultra short M2 steel balls to the bottom of each servo horn, 180° apart and secure with two M2 hex nuts. Install one ultra short steel ball on the bottom of the elevator servo horn, positioned at 20mm radius from the servo center and secure with one M2 hex nut. Attach pushrods D & E and adjust the servo horn subtrims to level the swashplate.



## Step 56 Idle Adjustment Screw & Carburetor Spring

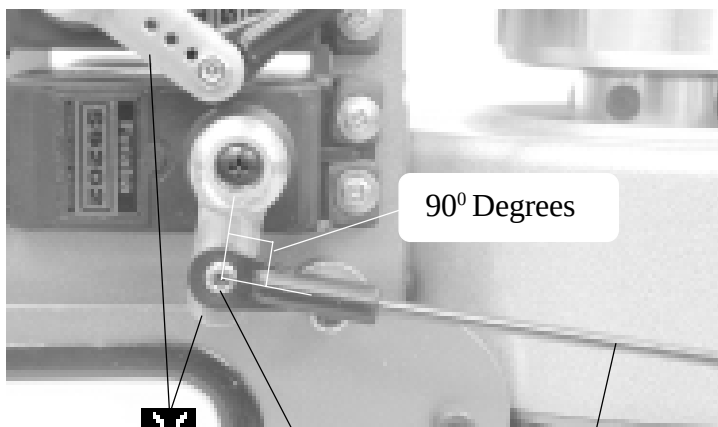
The idle adjustment screw is used to limit the travel of the throttle valve inside the carburetor. Turn the adjustment screw until the point is flush to the bottom of the rotary lever, this will be the throttle stop position. The spring is already installed on the carburetor and should be left in place. The spring provides the necessary tension along the length of the throttle lever axle to prevent wearing of the shaft prematurely. Install the carburetor to the engine crankcase using the screws and gaskets included with the engine with the primer bubble facing rearward and the fuel fittings on top.



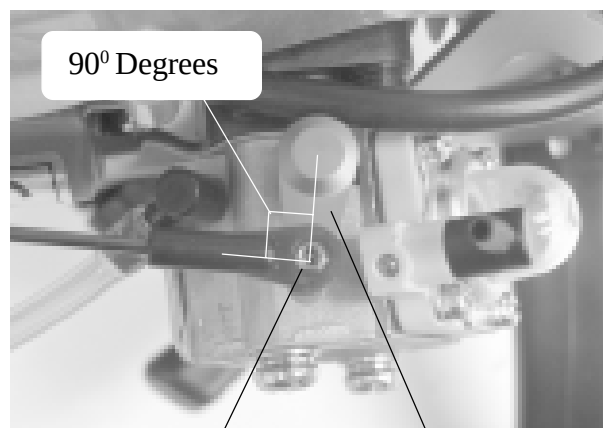
Idle Screw, position flush to bottom of throttle lever.

## Step 57 Throttle Pushrod & Carburetor Arm

Before the carburetor arm is tightened to the carburetor throttle shaft, the pushrod will be attached and adjusted to achieve a linear geometry that will result in a 90° degree angle between the pushrod and both the servo horn and the machined carburetor arm. Install one steel ball into the carburetor arm positioned in the center hole (13.5mm from the center of the arm) and the servo horn at 13.5mm, using L242 Blue threadlock. If you have not already done so, shorten the throttle pushrod from 104mm to 94mm by cutting 5mm off each end. Install the ball links and set pushrod F to 112mm center to center. Move the collective stick to the center and press the servo horn onto the servo close to the final angle. Slide the carburetor arm over the throttle lever shaft and attach Pushrod F. Using the subtrim on the throttle channel, fine tune the servo horn to achieve the 90° degree setting. Looking through the venturi, move the valve to the 45° position and lightly tighten the M3x4 set screw on the side of the carburetor arm. Check the end points and continue to adjust the set screw position until the carburetor will move through the entire throttle range with out binding. Once complete, firmly hold the external throttle lever, remove and apply L242 Blue threadlock to the M3x4 set screw and tighten in place.



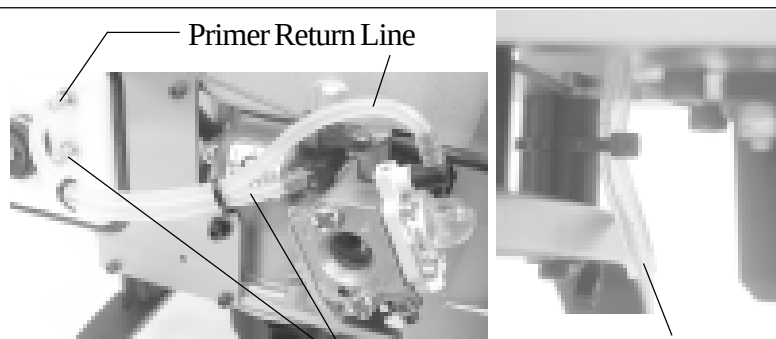
Optional #X2288 Metal Servo Arm Pack  
#CNLR1018 Ultra Short Steel Ball & M2 Hex Nut  
#HW6192C Pushrod F 112mm (center to center)



#CNLR1018 Ultra Short Steel Ball & M2 Hex Nut  
#HW6192B Carburetor Arm & M3x4 Set Screw

## Step 58 Fuel Lines

Of the three lines to the fuel tank, both the primer return line and the atmosphere line can use the 1/8" ID fuel line. The fuel pickup line on the Z231H engine should use the same 1/8" ID fuel line but use the larger 3/16" ID fuel line on the Z260H engine. The atmosphere line should run from the top of the fuel tank, upward and looped near the top of the vertical frame and then routed and tied to one of the landing gear spacers, making sure that the fuel line extends 1/4" past the plastic struts.



Tygon fuel line not included.

Fuel Pickup Line

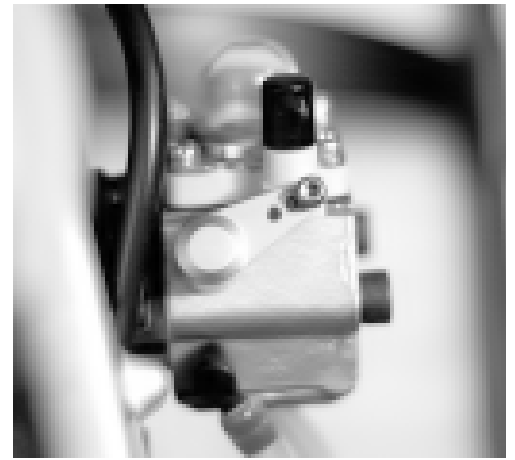
Atmosphere Line

## Optimal Throttle Arm Positioning.

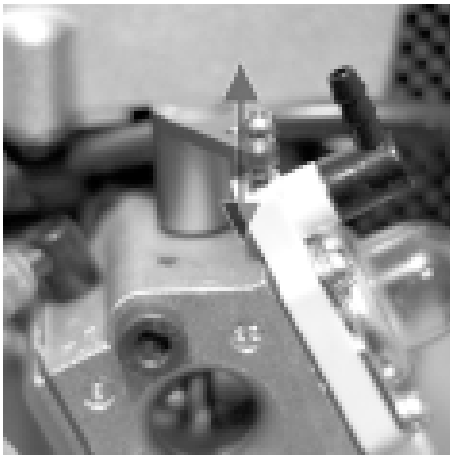
Following is a method of achieving maximum deflection range in the throttle control. This is the recommended setup to get top performance out of your gas powered Predator.



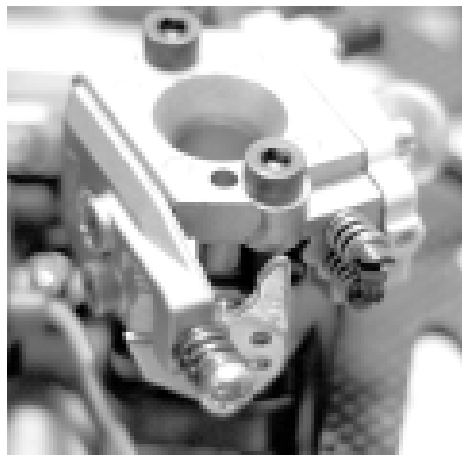
In the closed position it will be difficult to reach the set screw for the throttle arm. You should follow these guidelines for optimal throttle performance in the Predator Gasser.



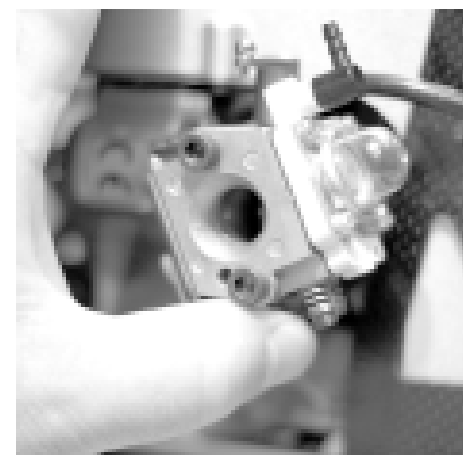
The ball for the throttle lever must be placed in the furthest hole from the center for best deflection.



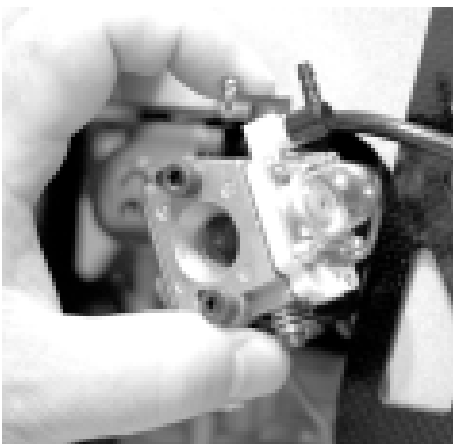
Set the throttle to the full closed position. The control ball on the throttle arm should be aligned as pictured aligned with the brass ball in the bulb plate.



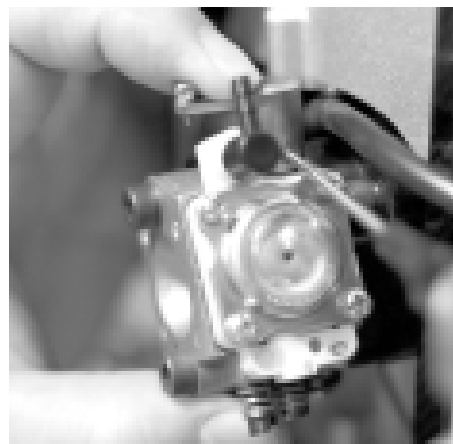
This is the throttle control pointer plate. When the set screw is tightened, the throttle arm moves this plate.



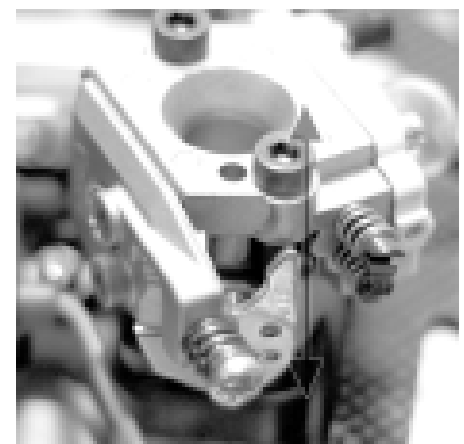
Grab the throttle pointer and move it with your thumb until exposing the set screw. Prepare your index finger to hold the position of the throttle arm.



After exposing the set screw carefully hold the position of the throttle pointer and arm in order to tighten the set screw.

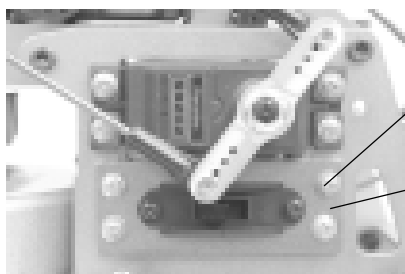


Try testing the method of positioning the arm. Tighten set screw with locktite only when position is final.



The halfway point on the throttle is found by aligning the flat long end of the throttle pointer with the bolt as shown.

## Step 58A Radio Switch Mount

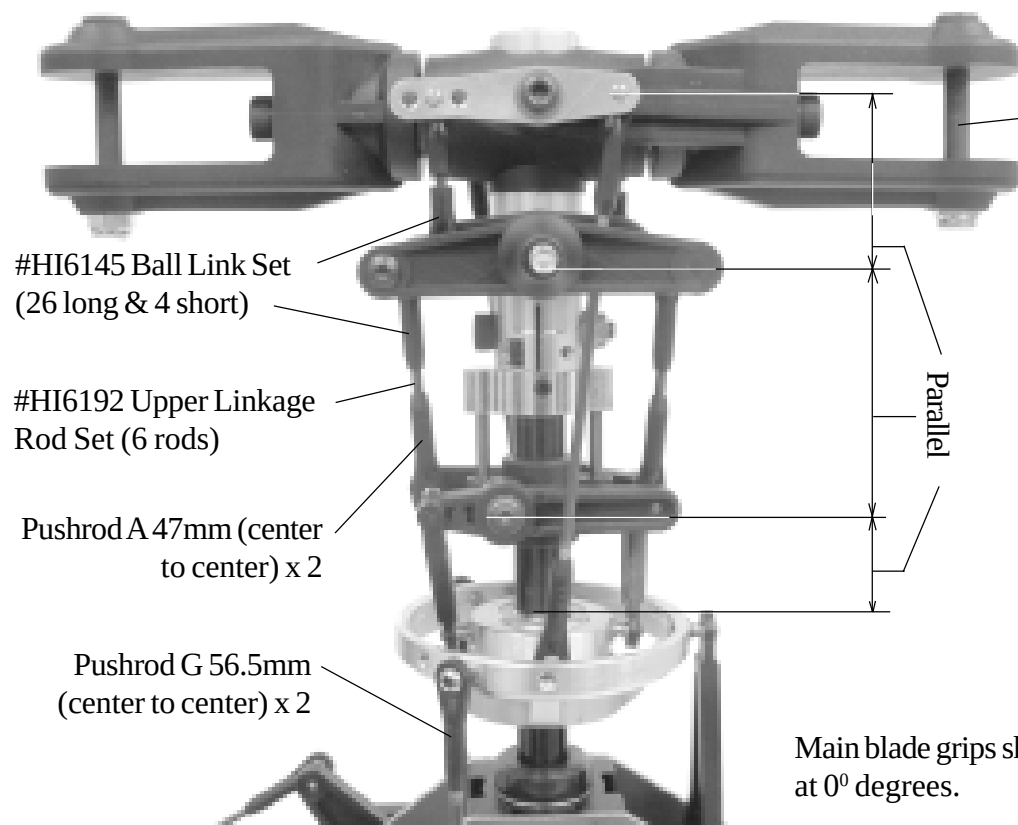


M2.3x12 Self Tap  
Screws x 4 &  
#HI3205 Servo  
Mount Tabs x 2  
#CN2290  
Switch Mount

Position the switch mount plate in the empty servo opening. Install the switch and insert two M2.3x12 Phillips self tapping screws through the left side and start the servo mount tabs. Slide the plate in place and secure the right side screws. Normally, the switch is off in the rear position.

## Step 59 Upper Rotorhead Pushrods

Attach pushrod A to the washout control arms and pushrod C from the single side of the bell mixer down the to the long ball on the inner race of the swashplate, being careful when connecting ball links to install the link in the correct direction. When the collective stick is centered the blade pitch should be set to  $0^{\circ}$  degrees and the bell mixer, flybar arms, washout arms and swashplate should be parallel. It should be noted that a perfect parallel geometry is not possible but get as close as to parallel as possible within one half ball link rotation.



#HI6145 Ball Link Set  
(26 long & 4 short)

#HI6192 Upper Linkage  
Rod Set (6 rods)

Pushrod A 47mm (center  
to center) x 2

Pushrod G 56.5mm  
(center to center) x 2

#HW6001 M5x35  
Socket Cap Screws x 2  
& M5 Locknut x 2



When attaching all pushrods, make sure that same length pushrods are actually the same length from the beginning otherwise it will be difficult later to figure out where the source of the linkage problems.

Main blade grips shown  
at  $0^{\circ}$  degrees.

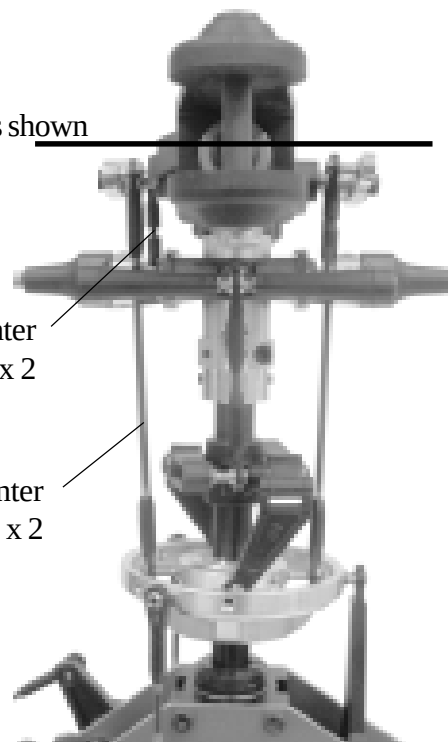
## Pitch Range Settings

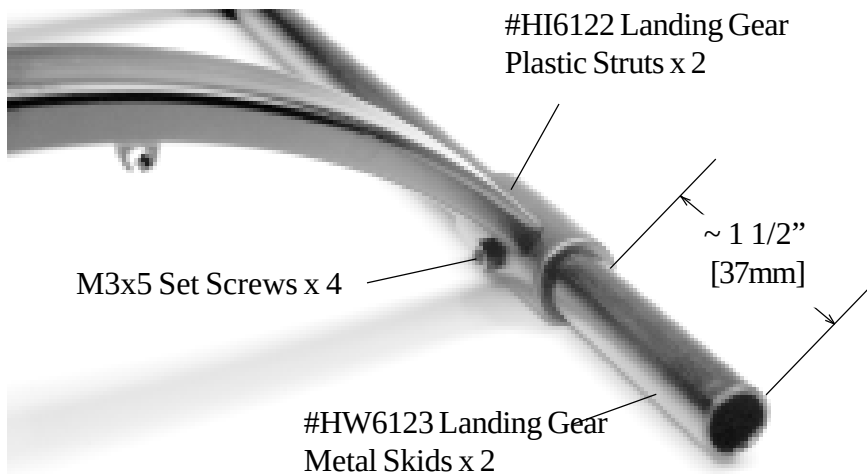
The following table should be used as a guide while setting up the pitch curves in the different flight modes on the transmitter.

| Mode | Description   | Low | Mid | High |
|------|---------------|-----|-----|------|
| N    | Normal        | -6  | 0   | +10  |
| 1    | Idle Up 1     | -10 | 0   | +10  |
| 2    | Idle Up 2     | -10 | 0   | +10  |
| H    | Throttle Hold | -10 | 0   | +12  |

Pushrod B 26mm (center  
to center) x 2

Pushrod C 99mm (center  
to center) x 2





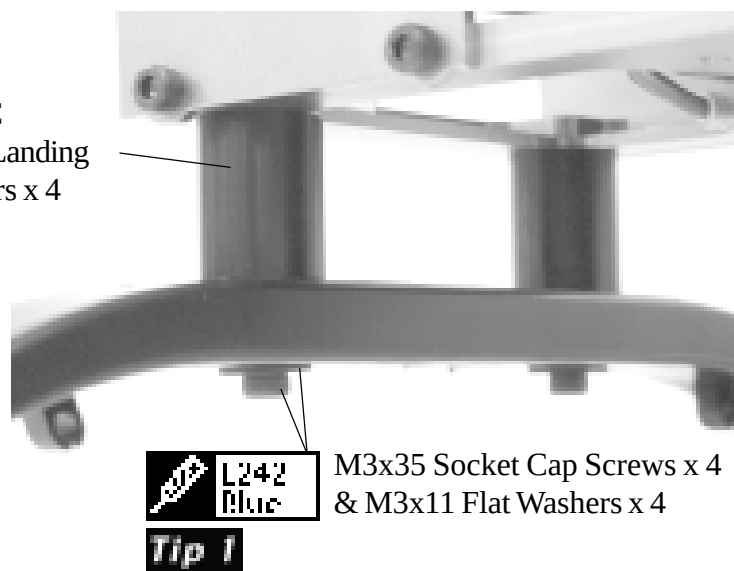
## Step 60 Landing Gear Assembly

Assemble the metal landing skids onto the plastic struts, noting that the correct direction is to have the struts sweep forward. Position the rear strut at 37mm from the end of the skid and secure the M3x5 set screw. Leave the front strut loose for now.

## Step 61 Landing Gear Spacers

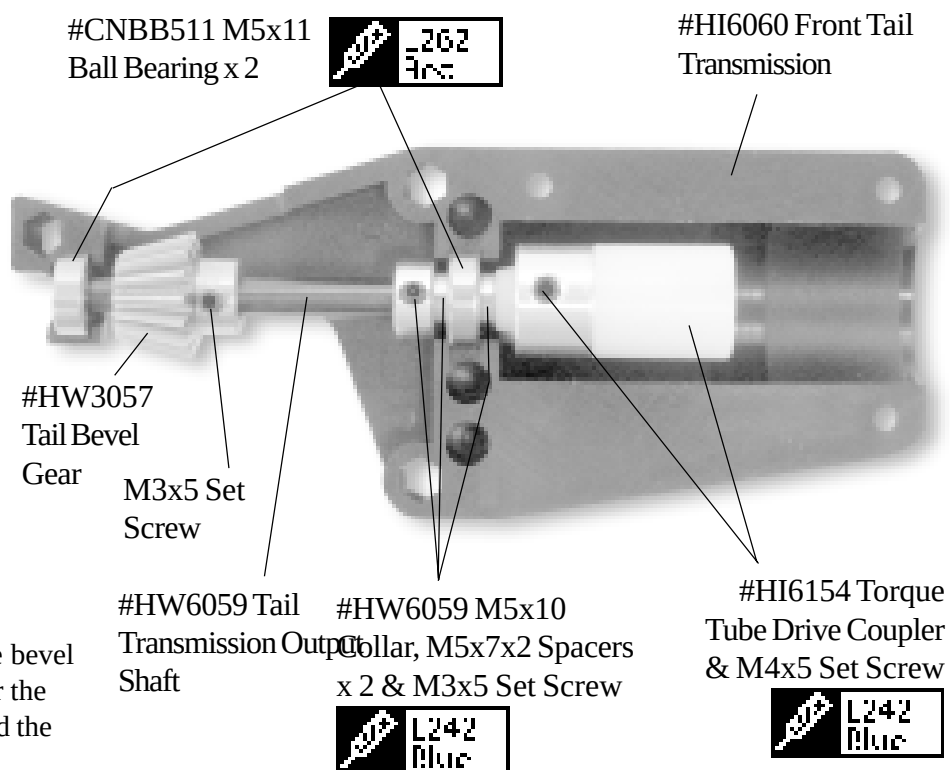
Measure and drill new holes spaced 60mm apart for the landing struts. Starting with the rear landing strut, insert two M3x35 socket cap screws with M3x11 flat washers from the bottom of the plastic strut, through the landing gear spacers. Apply L242 Blue threadlock to the exposed threads and thread into the landing gear frame. Align the front struts and attach the bolts and spacers. Remember to insert and secure the remaining two M3x5 set screws to secure the front landing struts to the skids.

#HW6127C  
M3x15x19 Landing Gear Spacers x 4



## Step 62 Tail Transmission

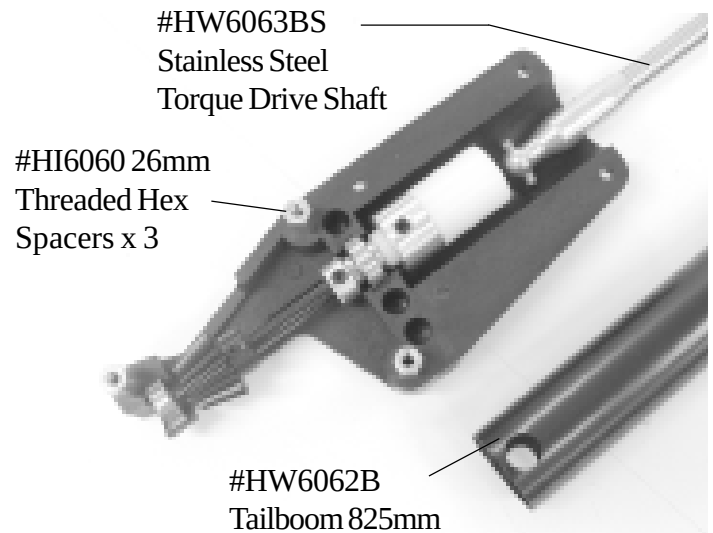
The tail transmission output shaft is already assembled. We suggest that you disassemble the components and carefully bond the bearings in place using L262 Red threadlock. Starting with the M5x10 collar positioned on the middle flat spot on the shaft. Slide one M5x7x2 spacer and M5x11 ball bearing on the short end and carefully bond the bearing. Slide another spacer and finally the torque tube fitting and its M4x5 set screw using L242 Blue threadlock. Slide the gear and position and bond the front bearing using the transmission for alignment.



Insert the M3x5 set screw into the bevel gear but leave this loose until after the transmission has been installed and the tail gear mesh is set.

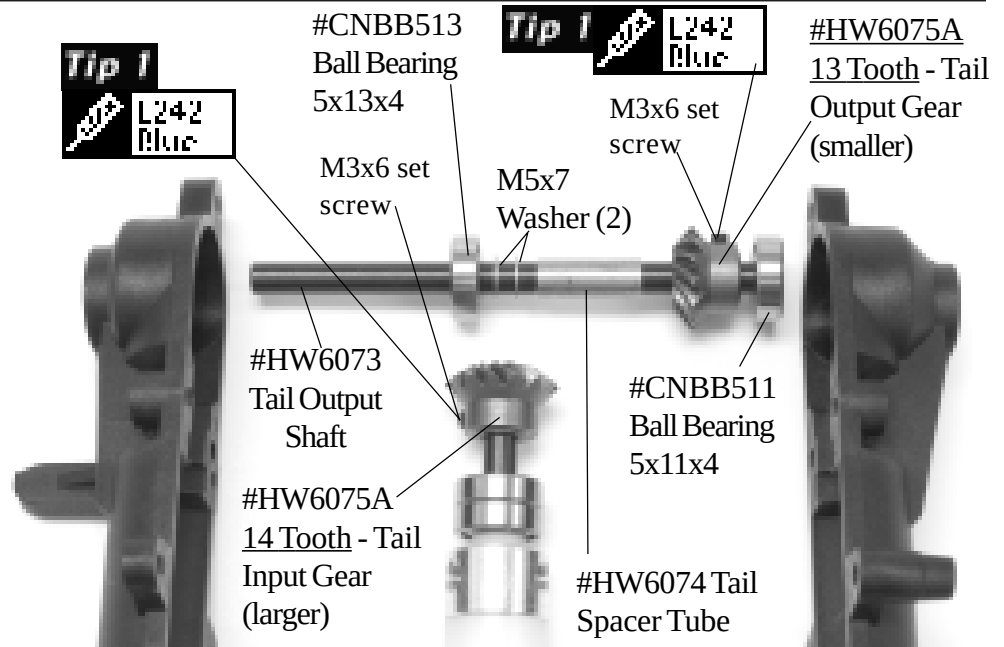
### Step 63 Tail Boom and Torque Drive Shaft

The tail transmission and tail gear box have the same circular mounts that engage the tail boom and lock it in position. Apply a few drops of light oil (Triflow) to both bearings on assembled torque drive shaft and apply a small amount of liquid soap to the o-rings. Looking at the bearing supports, press the drive shaft into the tail boom so that the shaft keeps the supports together. If pressed in the wrong direction, the support will disassemble. Generally center the tail drive shaft inside the tail boom. Press three threaded hex spacers into one half, slide and position the tail boom flush to the front edge and close with the second tail transmission half.



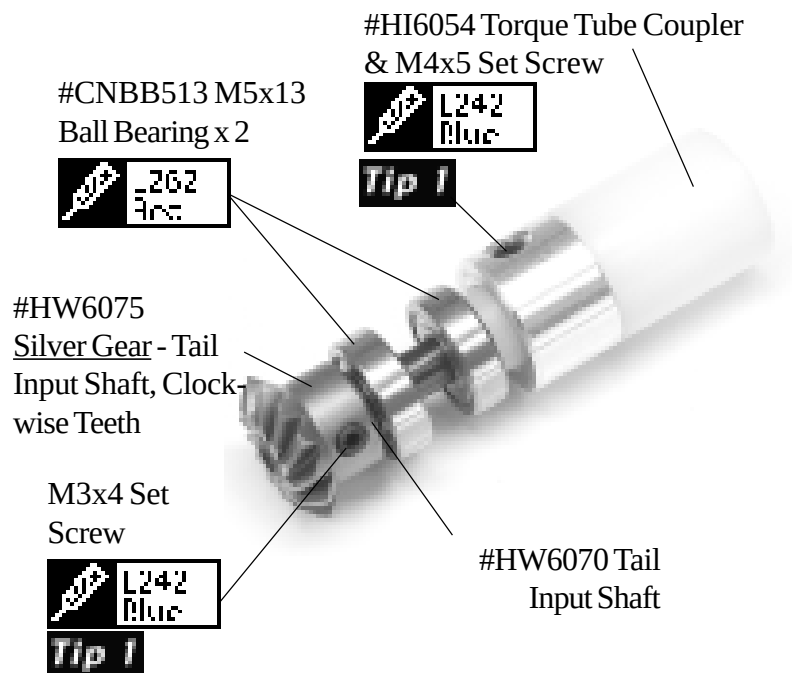
### Step 64 Tail Output Shaft & Gear

The tail output shaft has an M2 through hole and an M3 threaded hole in one end of the shaft. Insert one M3x6 set screw into the end using L242 Blue threadlock and tighten until the set screw stops. Slide the tail output gear (smaller 13 teeth) onto the tail output shaft with the gear teeth towards the solid end and align the hole in the gear to the hole in the shaft. Secure with one M3x4 set screw using L242 Blue threadlock. Slide the spacer tube onto the tail output shaft and position against the (larger 14 teeth) gear. Then slide on the two M5x7 washers before sliding on the ball bearing (5x13x4).



### Step 65 Tail Input Shaft & Gear

The tail output shaft has an M2 through hole and an M3 threaded hole in one end of the shaft. Insert one M3x6 set screw into the end using L242 Blue threadlock and tighten until the set screw stops. Slide the tail input gear (silver) onto the tail input shaft with the gear teeth flush to the hollow end and align the hole in the gear to the hole in the shaft. Secure with one M3x4 set screw using L242 Blue threadlock. Slide two M5x13 ball bearings and the torque tube coupler onto the tail shaft and install temporarily into one half of the tail gearbox (positioning the bearings) and secure the M4x5 set screw when the torque coupler and the silver gear are flush to the bearings. Remove the assembly, press the bearings together and apply a small amount of L262 Red threadlock on the shaft in the final positions of the bearings. Slide the bearings back in place and put back into the gearbox half to allow the threadlock to dry.

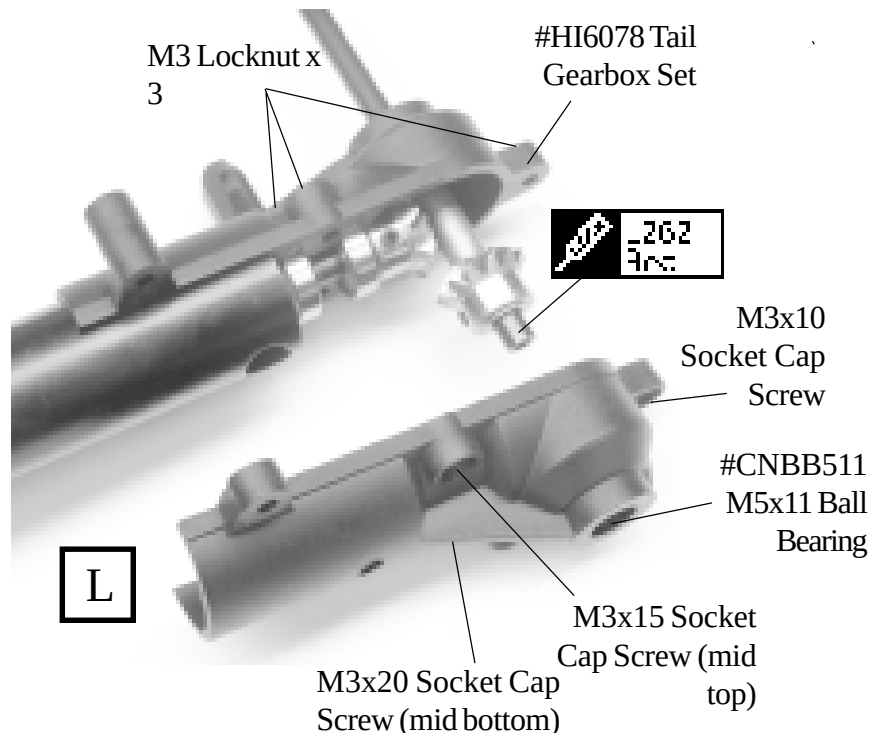
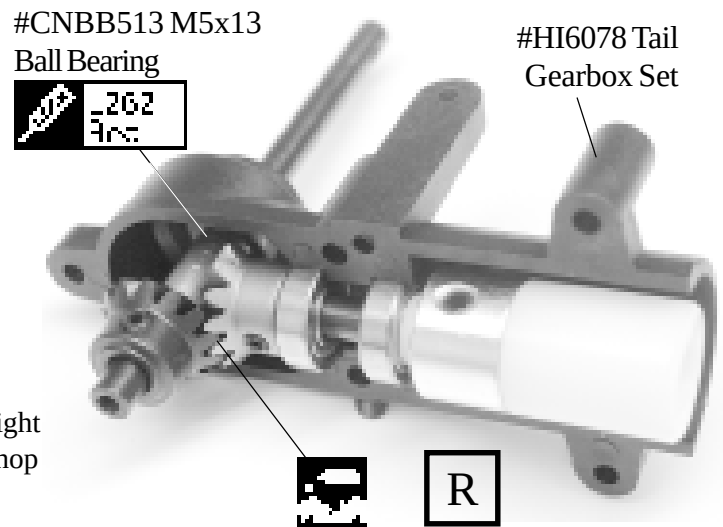


## Step 66 Tail Gear Mesh

Apply a small amount of L262 Red threadlock to the shaft ahead of the spacer on the tail output shaft and slide one M5x13 bearing against the spacer. Remove the tail input shaft and position both the input and output shafts into the right side of the tail gearbox. Apply a liberal amount grease to cover the gears.

**Tip** Tail gear mesh is controlled by the gears. Initially the tail mesh will be tight until the tail gears wear in.

Grease to be used inside the tail gearbox should be a teflon, light lithium or silicon type of grease commonly found in a hobbyshop for R/C cars. Do not use any grease on any other gears.



## Step 67 Tail Gearbox Assembly

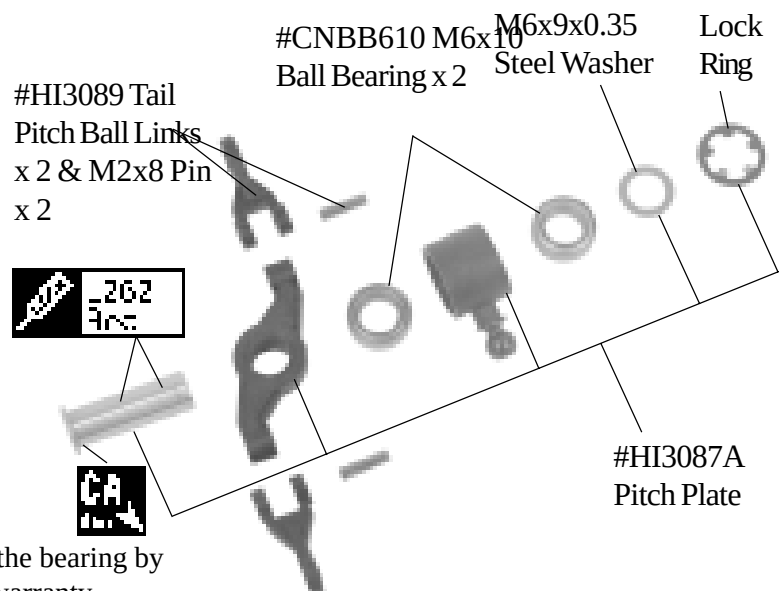
Apply a small amount of L262 Red threadlock to the end of the tail output shaft and slide one M5x11 ball bearing in place flush with the gear. Slide the tail boom into the left half, ensuring that the hole in the tailboom half engages the boss in the gearbox. Press the left tail gear box half to close the gearbox and insert one M3x10, M3x15 and M3x20 socket cap screws from the left half. Secure using three M3 locknuts.

Make sure that the tail output shaft is mounted on the right side of the helicopter.

## Step 68 Tail Pitch Plate

Apply a small amount of slow cyanoacrylate glue to the lip on the brass tube and insert into the flat side of the pitch plate (the molded stand off is flush to the bearing) and press firmly in place. Apply a small drop of L262 Red threadlock at the joint of the pitch plate and the tube and slide one M6x10 ball bearing, followed by the pitch plate housing. Slide the second M6x10 bearing and apply the L262 Red threadlock with a needle to the joint between the bearing and the brass tube. Allow the threadlock to cure. Slide the M6x9x0.35 flat washer and the lock ring to secure the assembly together. Using slow cyanoacrylate or JB Weld bond the lock ring to the brass tube.

**!** Extreme care must be taken to avoid damaging the bearing by leaking adhesive inside. This is not covered by warranty.



## Step 69 Tail Bellcrank

Press one M3x7 flange bearing into one side of the tail bellcrank, followed by one M3x5x3 spacer and the second M3x7 flange bearing from the other side. Slide the assembled pitch plate onto the tail output shaft.

#HW6001 M3x14  
Special Shoulder  
Screw

#HI3087A Pitch  
Plate Assembly

#CNBB37F M3x7  
Flange Bearing x 2

#HI6102 M3x5x2  
Spacer

#CNLR1003 M3x5x0.5  
Micro Washer

#CNLR1020

Medium  
Steel Ball

#HI6102 Tail  
Bellcrank Lever

## Step 70 Tail Rotor Blade Grips

Apply a small drop of L262 Red threadlock on the tail hub near the bearing stop. Slide one M4x10 ball bearing followed by the plastic tail rotor grip. Look carefully at the thrust bearing and slide the thin race (larger inside diameter) followed by the ball race, remember to grease the ball race, followed by the thick race (smaller inside diameter) inside the tail grip. Slide one M3x5x0.5 micro washer and the M3x9 ball bearing. Apply a drop of L262 Red threadlock to the threads and tighten the M3 locknut until the tail grip rotates smoothly without binding. Repeat for the other side.

#HW3098A  
Steel Tail Rotor  
Hub

#CNBB410  
M4x10 Ball  
Bearing x 2

#CNLR1013 Short  
Steel Ball x 2

#HI6096 Tail  
Blade Grips x 2

#CNLR1003  
M3x5x0.5 Micro  
Washer

#CNBB39 M3x9  
Ball Bearing x 2

M3 Locknut x  
2

thin race  
(first)  
larger inside  
diameter

#CNBB49T  
M4x9 Thrust  
Ball Bearing

thick race  
(second)  
small inside  
diameter

## Step 71 Tail Rotor Hub Assembly

Carefully form the threads in the tail gear box mount for the tail bellcrank using an available M3 socket cap screw. Align the hole in the tail bell crank to the steel ball on the tail pitch plate and insert the M3x14 special socket cap screw through the bellcrank and slide on one M3x5x0.5 micro washer. Apply a small amount of slow cyanoacrylate glue to the newly formed threads in the bellcrank mount and tighten the screw until there is no play. Slide the tail rotor grip assembly onto the tail output shaft, ensuring that the steel ball is on the leading edge of the grip as it would rotate into the downwash of the main rotor blades. Align the hole in the hub with the indent in the shaft and secure using one M3x4 set screw using L242 Blue threadlock. Attach the tail pitch links to the steel balls on the tail blade grips.

#HW6001 M3x14  
Special Shoulder  
Screw

M3x4 Set  
Screw

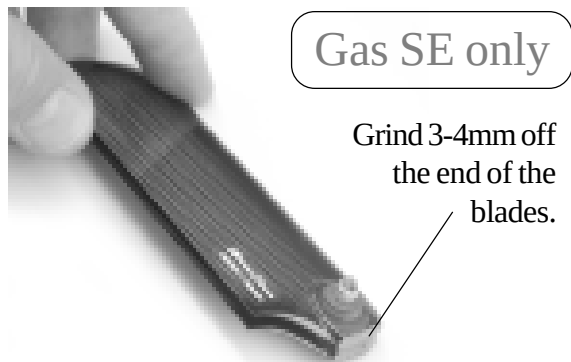
L242  
Blue  
Tip 1

Steel ball mounted closest  
to the gearbox.

Gearbox Bottom View

## Step 72 Carbon Tail Rotor Blades - Gas SE

The carbon tail rotor blades will not fit the tail rotor grips without trimming the ends. Attach the two rotor blades together and grind 3-4mm off the end of both blades as shown.



#HW6204  
M3x10x1.5  
Spacers x 4

#HI6099 95mm Tail  
Rotor Blades x 2

CN261056  
105mm Rotortech  
Tail Blades x 2

#HW6001 M3x18  
Special Socket Cap  
Screw

## Step 73 Mount Tail Blades

Slide one M3x18 special socket cap screw from the inside of the tail rotor grip and position the first M3x10x1.5 spacer, insert the tail blade, another spacer and secure using one M3 locknut from the molded recess on the outside. When correctly installed, the leading edge of the tail rotor blades will rotate into the down wash from the main rotor blades.

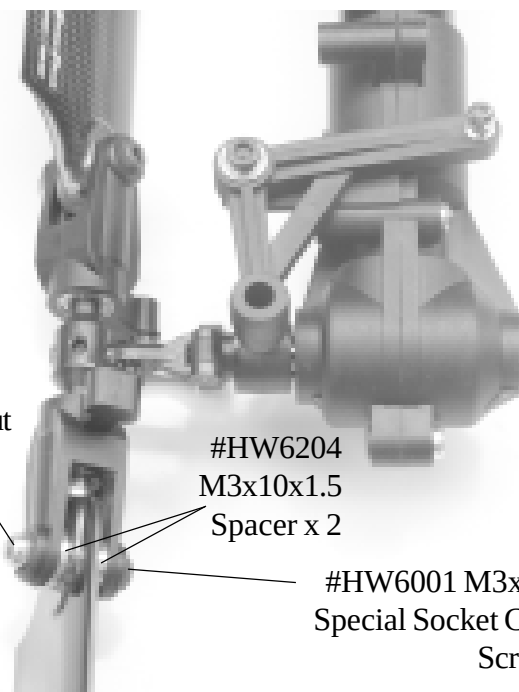
Tail blade tension should be set tight enough that the rotor blade will stay straight on its own, but will pivot easily when the blade tip is moved.

**Tip** After flying the model, if a vibration is noticed on the horizontal fin, the complete tail rotor assembly can be removed with the hub and further balanced using a High Point balancer.

M3  
Locknut

#HW6204  
M3x10x1.5  
Spacer x 2

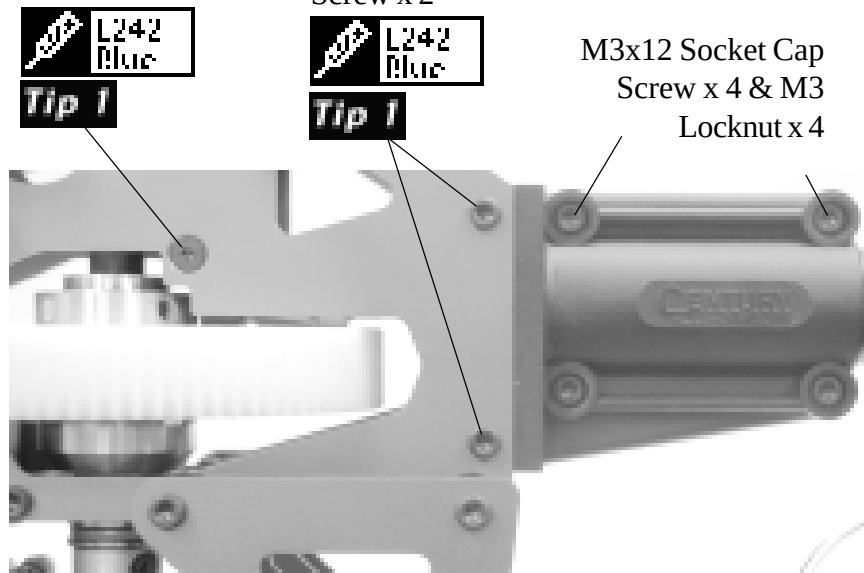
#HW6001 M3x18  
Special Socket Cap  
Screw



M3x10 Flat Head  
Screw x 2

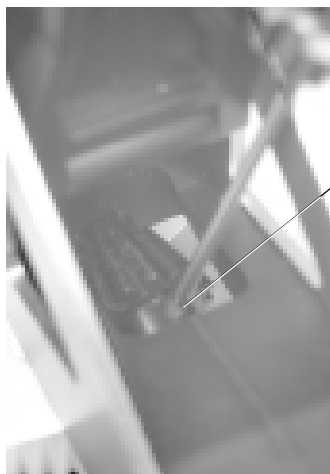
M3x8 Socket Cap  
Screw x 2

M3x12 Socket Cap  
Screw x 4 & M3  
Locknut x 4



## Step 74 Tail Boom Transmission Mount

Insert four M3x12 socket cap screws through the tail transmission mount over the tail boom (make sure the tail rotor is on the right side when viewed from behind) and secure with four M3 locknuts inserted into the molded recesses. Look at the threaded hex spacers and make sure that they are flush on both sides of the mount. Slide the completed tail boom assembly, aligning the three holes on the upper side frames and roughly position the tail bevel gear on the inner gear. Insert two M3x10 flat head cap screws and four M3x8 socket caps screws using L242 Blue threadlock. Do not over-tighten these bolts!



M3x5 Set Screw



**Tip 1**

Make sure the set screw is positioned over the flat spot in the tail transmission shaft.



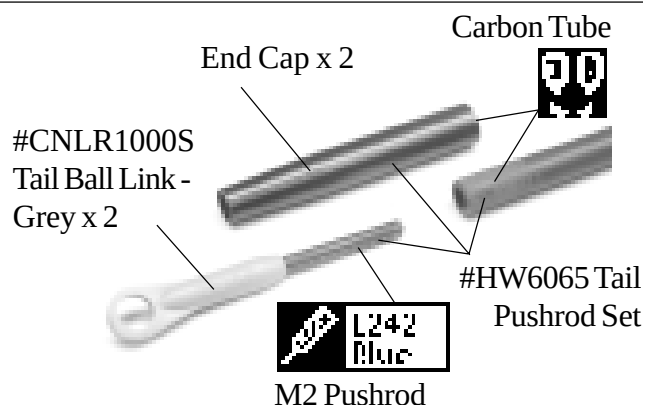
As a reminder, the main gear, pinion gear and tail bevel gear should NOT be lubricated! Any type of lubricant will attract dirt that will ultimately damage the helicopter gears.

## Step 75 Tail Bevel Gear Mesh

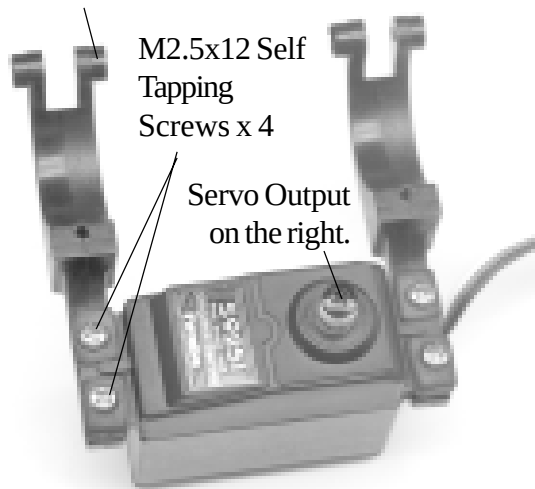
Now that the tail transmission is in place the tail bevel gear mesh must be set. Rotate the tail transmission shaft until the flat spot is visible through the hole in the bevel gear. Apply L242 Blue threadlock to the M3x5 set screw and insert into the bevel gear. Slide the gear forward until there is zero backlash but the inner gear does not bind. The initial flights will wear in the gears, eliminating any high spots that may be noticeable when turned by hand.

## Step 76 Carbon Tail Pushrod

Insert and mark the position where the end cap overlaps one end of the carbon pushrod. Remove and sand through the glossy surface up to the marked position. Sand or score the inside surface of the end cap. Mix up JB Weld or slow Epoxy and bond only one end cap onto the carbon pushrod. Thread one Grey ball link onto the M2 pushrod, inserting the rod 10mm into the link. Apply L242 Blue threadlock to the pushrod and thread into the end cap until it stops. Allow it to cure overnight for highest strength.



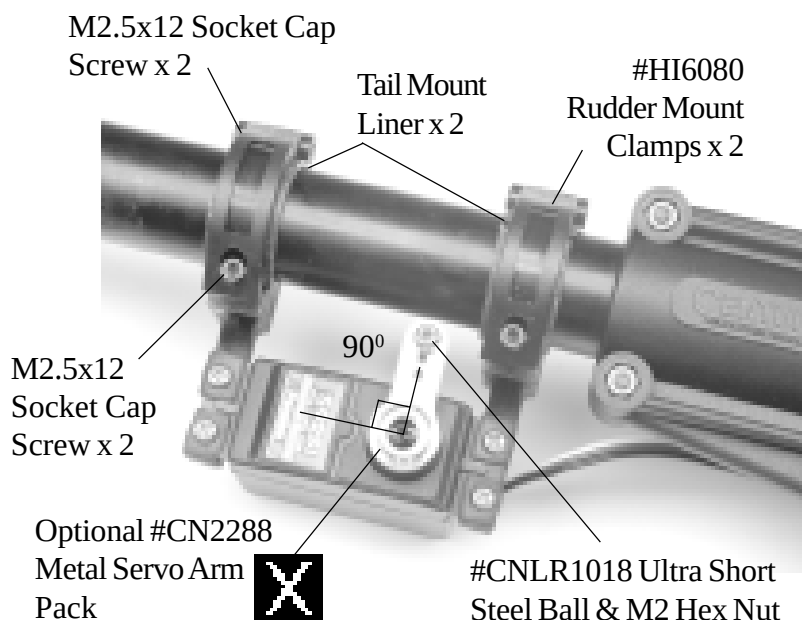
#HI6080 Rudder Mounts x 2



Insert one steel ball into the servo arm at 12-14mm from the servo center and secure with one M2 hex nut. Position the servo horn on the servo at 90° degrees with the transmitter trim in the center. Wrap the liners and insert two M2.5x12 socket cap screws to secure the rudder mount to the tail boom next to the tail transmission. Continue tightening until the liners are seated but the rudder servo can still be moved. After the rudder pushrod is installed the exact position will be set.

## Step 77 Rudder Servo Mount

Insert the rubber grommets and the eyelets from the bottom of the servo. Attach the two mounts to the servo from behind the mounting tabs with the servo output shaft on the right side using four M2.5x12 self tapping screws. Attach the matching rudder mount clamps using two M2.5x12 socket cap screws at the pivot ends, notice the bolts only go in one way. Curve the mount liners around the tail boom and trim 1-2mm from the length for a good fit. A slight gap is preferred.

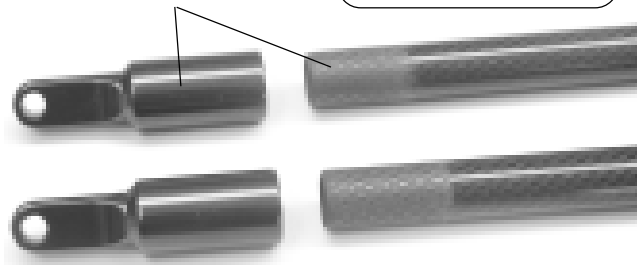


### Step 78 Carbon Tail Support Struts - Gas SE

Insert and mark the position where the machined end fittings overlap the ends of carbon struts. Remove and sand through the glossy surface up to the marked position and ensure that the fittings will easily slide over the tubes. Sand or score the inside surface of the end fittings. Mix up JB Weld or slow Epoxy and bond the fittings in place making sure one end fitting is turned 90° degrees on each strut. Allow to dry overnight.

#HW6202A Carbon Support Struts x 2 & End Fittings x 4

Gas SE only



### Step 79 Horizontal Tail Fin

Insert two M3x35 socket cap screws through the horizontal fin and slide the the tail fin mount half ( thicker mount half with the square ends) against the fin. Position over the tail boom and slide the matching fin mount with the tapered ends (taller side of the taper toward the mechanics), followed by the aluminum tail support struts and loosely install the two M3 locknuts.

#HI6067  
Horizontal Tail  
Fin

#HI6068  
Upper Tail Fin  
Mount

M3x35  
Socket Cap  
Screw x 2

#HW6202  
Aluminum  
Support  
Struts x 2

M3 Locknut  
x 2

#HI6068  
Lower Tail Fin  
Mount

### Step 80 Horizontal Tail Fin - Gas SE

Insert two M3x40 socket cap screws through the horizontal fin and slide the the tail fin mount half ( thicker mount half with the square ends) against the fin. Position over the tail boom and slide the matching fin mount with the tapered ends (taller side of the taper is towards the mechanics), followed by the carbon tail support struts and loosely install the two M3 locknuts.

Gas SE only

#HI6067A  
Carbon  
Horizontal Tail  
Fin

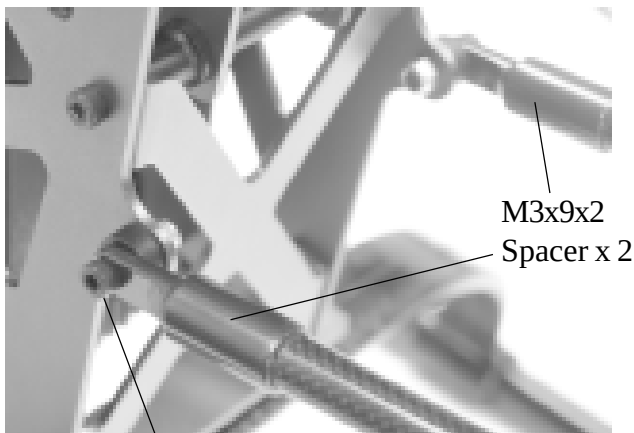
#HI6068  
Upper Tail Fin  
Mount

M3x40  
Socket Cap  
Screw x 2

#HW6202A  
Carbon  
Support  
Struts x 2

M3 Locknut  
x 2

#HI6068  
Lower Tail Fin  
Mount



M3x12 Socket Cap Screws x 2  
& M3 Locknuts x 2

## Step 81 Tail Support Struts

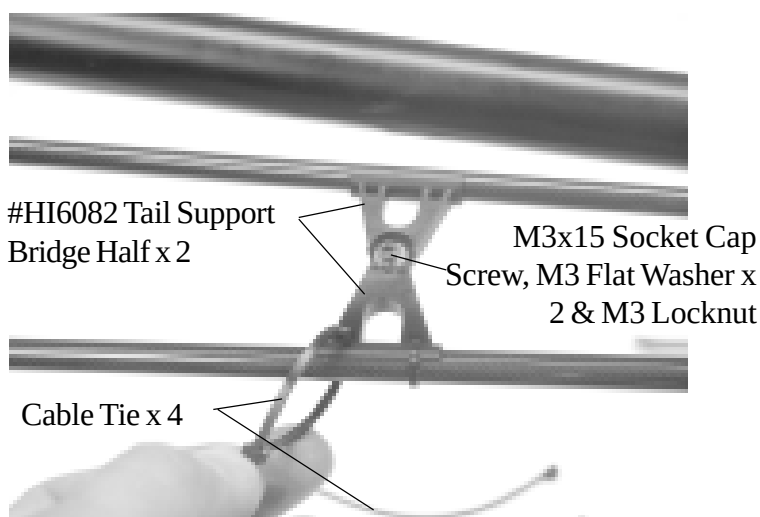
Insert one M3x12 socket cap screw through the strut fitting (carbon or aluminum), one M3x9x3 plastic spacer, through the mount hole in the rear side frame and secure with one M3 locknut. Repeat for the other side.

Now that the struts are mounted to the mechanics, position the horizontal fin square to the tail boom and tighten up the M3 screws and locknuts to secure the horizontal fin in place.

## Step 82 Tail Support Bridge - Gas SE

Slide one M3 flat washer onto the M3x15 socket cap screw and insert through the two mated support bridge halves, slide another washer and secure using one M3 locknut. Leave loose for now. Carefully press the curved ends over the struts and position the bridge as close to the mechanics as the slot adjustment will allow and tighten the center bolt. Secure the bridge in place using four cable ties and trim the ends.

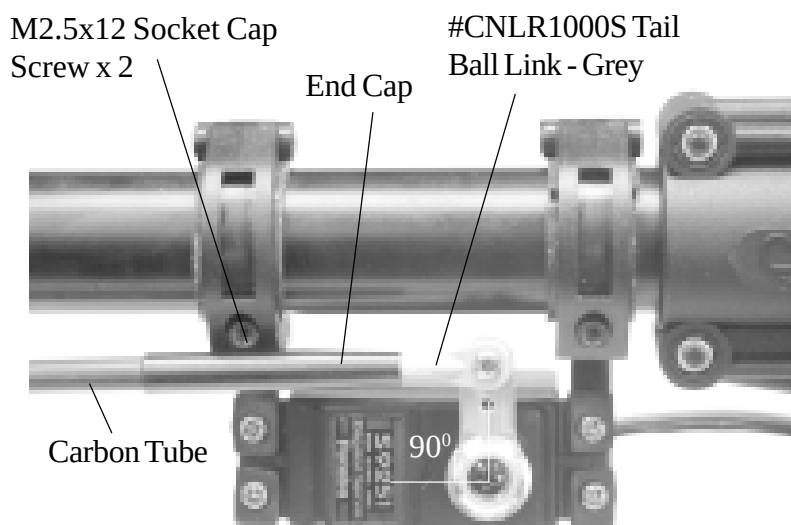
Gas SE only



Roughly positioned the rudder servo approximately 12mm away from the tail transmission. Temporarily assemble the end cap, pushrod and ball link and position over the steel ball when the rudder servo arm is 90° to the servo. Mark the carbon tube at the start of the end cap and then mark the offset distance the carbon tube will extend inside the end cap. Cut and sand the end of the pushrod and bond the end cap in position using JB Weld or Epoxy.

## Step 83 Rudder Pushrod Completion

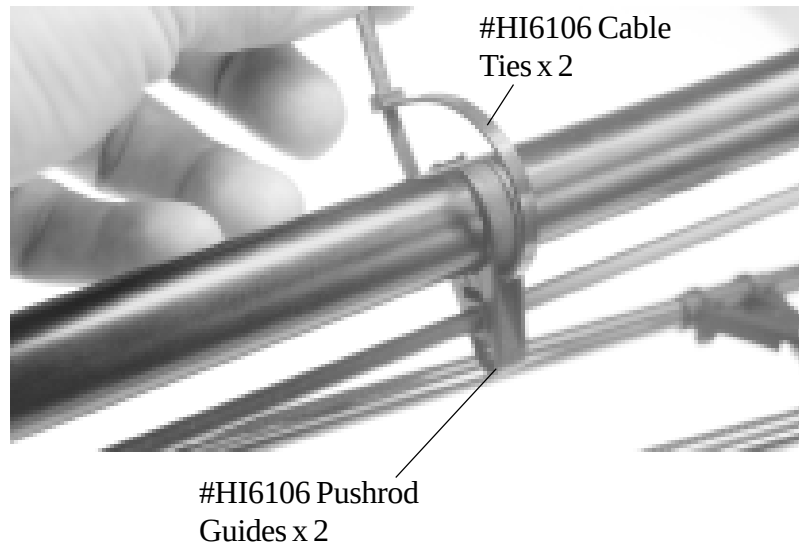
Slide the two pushrod guides over the unfinished end of the carbon tail pushrod and attach to the tail boom. Press the ball link onto the steel ball on the tail pitch bellcrank. Position one guide in front of the horizontal fin and one half way between the fin and the mechanics bringing the pushrod to the right side of the helicopter.



## Step 84 Tail Pushrod Guides

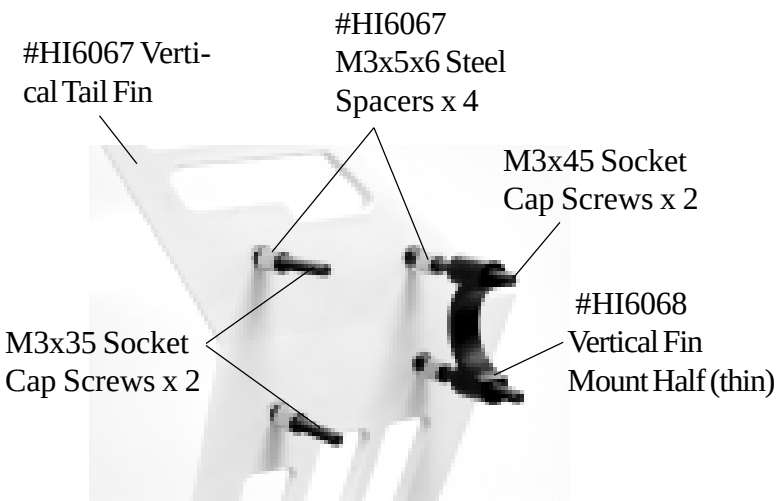
Once the pushrod has cured, the servo position can be fine tuned by moving the servo mount, generally position the pitch plate assembly centered between the tail hub and the tail gearbox. The instructions included with the gyro will have specific instructions for the tail setup.

Insert two cable tie wraps in the rudder pushrod guides and snug them up. Disconnect the ball link from the rudder servo horn and adjust the guides and the angle of the rudder servo to get the smoothest movement. Once all binding has been removed tighten the cable ties with pliers and trim the excess. Remember to tighten the M2.5x12 socket cap screws in the rudder mount.



## Step 85 Vertical Tail Fin

Holding the vertical fin (plastic or carbon) insert two M3x35 socket cap screw through the rear holes and two M3x45 socket cap screws into the forward holes. Slide one spacer onto each screws and finally slide the vertical fin mount half (thinner than the horizontal mount) onto the forward screws.



#HI6067A Carbon Vertical Tail Fin

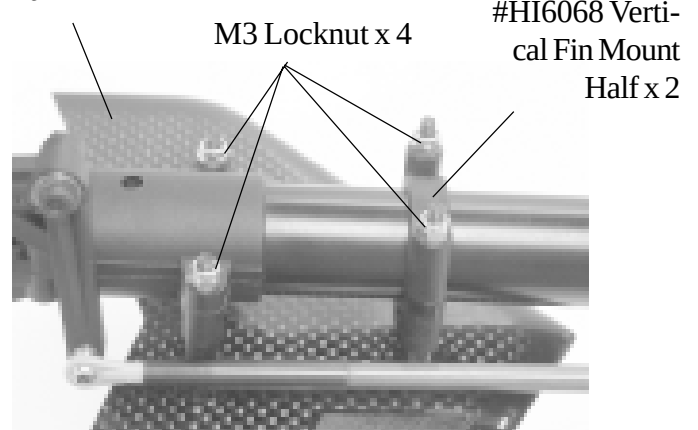
Gas SE only



## Step 86 Vertical Tail Fin Mounting

Holding the vertical fin (plastic or carbon) from the previous step and position the fin on the left side of the tail boom. Insert the M3x35 rear screws through the mounts in the tail gearbox and slide the matching vertical fin mount over the front screws to capture the tail boom. Secure in place using four M3 locknuts.

Carbon or Plastic Tail Fin



Be careful when tightening the four screws on the carbon tail fin. This fin has a hollow section and can be damaged if the screws are overtightened.

## Step 87 Windshield

Leave the protective plastic sheet on the windshield while the rough cut is made, leaving 3mm [1/8"] of extra material beyond the molded line in the windshield. Use a black marker if necessary to trace the line to see it clearly while cutting. Continue trimming and cutting the windshield until it will fit into the matching recess in the canopy.

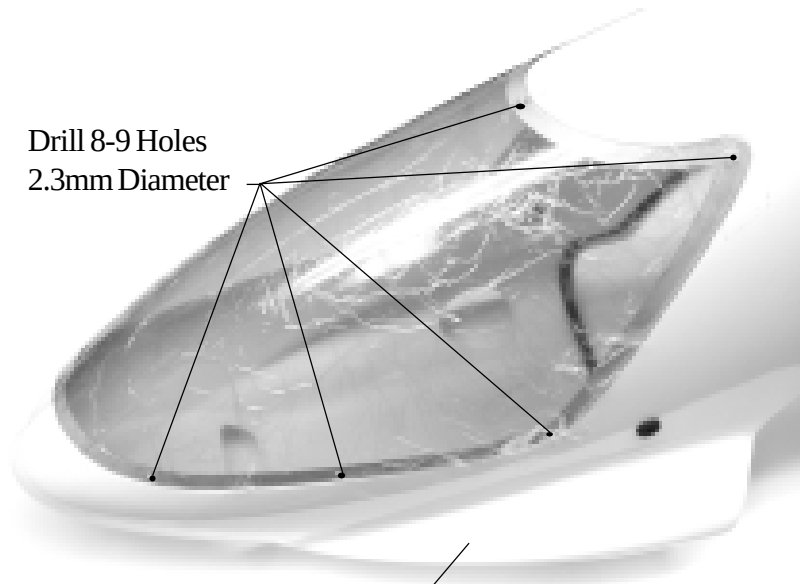
#HI6133 Windshield



## Step 88 Drilling the windshield Holes

Tape the windshield in place and mark 8-9 positions around the windshield's edge and centered in the recess of the canopy. Carefully drill all the holes using a 2.3mm [0.090"] drill bit. Remove the windshield and redrill the holes to 3mm [0.125"] in the windshield and set aside.

Drill 8-9 Holes  
2.3mm Diameter



## Step 89 Canopy Decals

Using scissors cut out the main cabin decals from the decal sheet. These can be trimmed along the colored edge of the decal. Clean the canopy with rubbing alcohol to remove any grease and position the decals as shown. Each decal has the position listed on the sheet for easy reference.



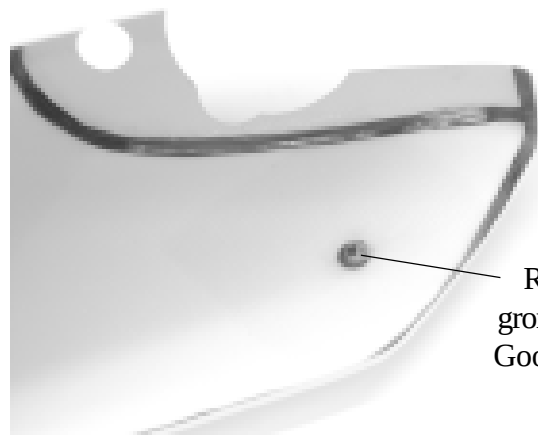
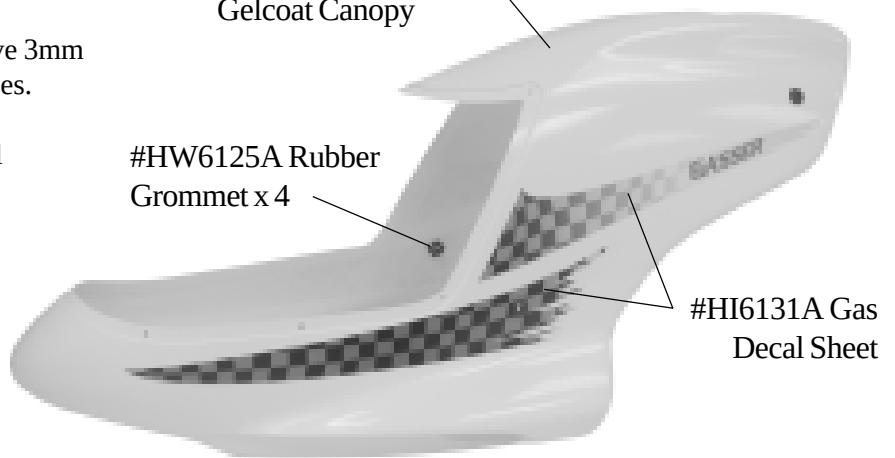
When cutting out the tail fin decals, leave 3mm [1/8"] of extra decal material on all edges.

It is better to plan the position of the lower decal to overlap the grommet hole. After the decals have been applied, insert the four rubber grommets.

#HI6130 Fiberglass  
Gelcoat Canopy

#HW6125A Rubber  
Grommet x 4

#HI6131A Gas  
Decal Sheet



Reinforce the  
grommets using  
Goop or Epoxy

## Step 90 Reinforce Rubber Grommet

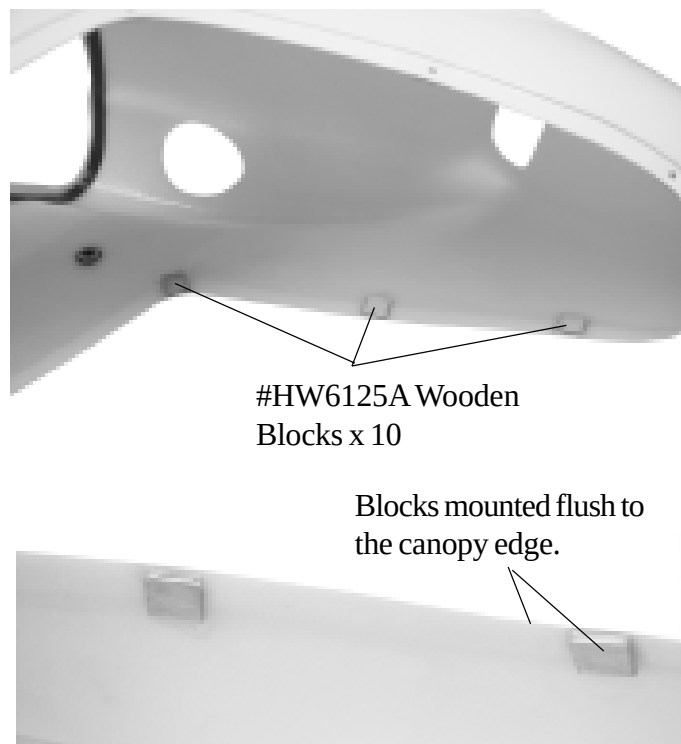
After the grommets have been installed, it is recommended to reinforce and bond them in place from the inside of the canopy. Using Goop adhesive or Epoxy, lift the inside edge and insert the adhesive between the grommet and the canopy to form a fillet around the outside edge.

## Step 91 Windshield Wooden Blocks

Using Epoxy, bond one wooden block from the inside of the canopy, centered over each hole for the windshield screws. Each block should be flush or slightly below the edge of the canopy. Let the Epoxy completely cure. Using the 2.3mm [0.090"] drill bit, redrill the holes through the wooden blocks. Using an available M3x6 self tapping screw, form the threads in all the wooden block.

Mount the windshield to the canopy using the M3x6 self tapping screws being careful not to overtighten the screws. The wooden blocks will hold the screws quite well. After the canopy is finished, the wooden blocks can then be painted white to match the canopy.

#HW3129A Canopy  
Thumb Screws x 2



#HW6125A Wooden  
Blocks x 10

Blocks mounted flush to  
the canopy edge.

## Step 92 Upper Canopy Mount Screws

When attaching the canopy to the helicopter, install the two M3x10 Phillips washer head screws to the upper canopy standoffs. This will keep the canopy in position during fast backwards flight.

#HI6131A Gas Decal  
Sheet



## Step 93 Tail Fin Decals

Cut out the tail fin decals from the sheet leaving 3mm [1/8"] of material along each edge. Clean both tail fins using rubbing alcohol and apply the decals. The decal sheet has the appropriate positions listed for each piece and can be copied in pencil to the backside of each decal section.



It is easier to apply the decals when the fins are removed from the helicopter. Take each section and align over the intended fin and continue trimming the edge of the decal to get a good fit.

# Predator Gas Replacement Parts

|          |                                            |           |                                                 |
|----------|--------------------------------------------|-----------|-------------------------------------------------|
| HI6009A  | COOLING FAN - GAS                          | HW6062B   | TAIL BOOM 855mm - GAS                           |
| HI6020A  | FIBERGLASS COOLING FAN SHROUD - GAS        | HW6063BS  | TAIL S/S TORQUE DRIVE SHAFT - GAS               |
| HI6031   | CCPM CYCLIC BELLCRANKS                     | HW6065    | TAIL PITCH CONTROL ROD - CARBON                 |
| HI6032   | CCPM ELEVATOR LEVER SET                    | HW6070    | TAIL GEARBOX INPUT SHAFT                        |
| HI6058B  | MACHINED TAIL GEAR - 70T CT DRIVE          | HW6073    | TAIL GEARBOX OUTPUT SHAFT                       |
| HI6058H  | MACHINED MAIN GEAR - 88T CT DRIVE          | HW6074    | SPACER TUBE - TAIL OUTPUT SHAFT                 |
| HI6058M  | INNER TAIL GEAR AUTO HUB - CT DRIVE        | HW6075    | TAIL GEAR SET                                   |
| HI6058N  | OUTER MAIN GEAR AUTO HUB W/T.B. - CT DRIVE | HW3098A   | STEEL TAIL ROTOR HUB                            |
| HI6060   | FRONT TAIL TRANSMISSION (L&R)              | HW6110A   | UPPER SIDE FRAME - L&R                          |
| HI6064A  | INNER GEAR AUTOHUB - SPRAGUE TYPE          | HW6112    | SERVO SIDE FRAMES (2)                           |
| HI6064B  | OUTER GEAR AUTOHUB - SPRAGUE TYPE          | HW6112B   | VERTICAL FRONT FRAME - GAS                      |
| HI6064C  | SPRAGUE AUTOHUB ASSEMBLY                   | HW6112C   | BATTERY TRAY - GAS                              |
| HI6064D  | SPRAGUE SHIM WASHER (2)                    | HW6115B   | FRONT LOWER FRAMES - L&R GAS                    |
| HI6067   | TAIL FIN SET - PLASTIC                     | HW6115C   | REAR LOWER FRAMES - L&R GAS                     |
| HI6067A  | TAIL FIN SET - CARBON                      | HW6117A   | REAR X FRAME - GAS                              |
| HI6068   | TAIL FIN MOUNT SET                         | HW6117B   | LANDING GEAR FRAME - GAS                        |
| HI6078   | TAIL GEARBOX (L&R)                         | HW6118    | COOLING FAN SHROUD PLATE - GAS                  |
| HI6080   | TAIL BOOM SERVO MOUNT SET                  | HW6118A   | PULL START MOUNT PLATE - GAS                    |
| HI6082   | TAIL STRUT SUPPORT BRIDGE SET - SE         | HW6123    | LANDING SKIDS - ALLOY 10mm (2)                  |
| HI3087A  | TAIL PITCH SLIDER SET                      | HW6123A   | LANDING SKIDS - ALLOY 12mm (2)                  |
| HI3089   | TAIL PITCH BALL LINKS                      | HW6125A   | CANOPY MOUNTS & GROMMET SET - GAS               |
| HI6096   | TAIL BLADE GRIP SET                        | HW6127B   | FRAME STANDOFF SET - GAS                        |
| HI6099   | TAIL ROTOR BLADES - PLASTIC (2) CLEAR      | HW6127C   | LANDING GEAR STANDOFF SET - GAS                 |
| HI6099-O | TAIL ROTOR BLADES - PLASTIC (2) ORANGE     | HW6146    | CCPM SWASHPLATE 120-140 DEGREE                  |
| HI6102   | TAIL PITCH LEVER SET                       | HW6173    | FLYBAR 520mm - ALL                              |
| HI6106   | TAIL PUSHROD GUIDES (2)                    | HW6180A   | FEATHERING SHAFT w/ BALL                        |
| HI6122   | LANDING STRUTS - PLASTIC (2)               | HW6182    | HEAD SHIM SET - 8x13(6), 8x15(2)                |
| HI6122A  | LANDING STRUTS - CARBON (1)                | HW6183    | HEAD THRUST BEARING SPACER (2)                  |
| HI3129A  | CANOPY MOUNT THUMB SCREWS (2)              | HW6192    | UPPER LINKAGE SET (6 RODS)                      |
| HI6130   | FIBERGLASS CANOPY ONLY                     | HW6192A   | LOWER LINKAGE SET (8 RODS)                      |
| HI6130A  | FIBERGLASS CANOPY w/ SOLID WINDSHIELD      | HW6192B   | THROTTLE LINKAGE & CARB ARM - GAS               |
| HI6131A  | PREDATOR GAS DECAL                         | HW6202    | TAIL BOOM SUPPORT STRUTS - ALLOY (2)            |
| HI6132A  | INSTRUCTION MANUAL - PREDATOR GAS & GAS SE | HW6202A   | TAIL BOOM SUPPORT STRUTS - CARBON (2)           |
| HI6133   | WINDSHIELD ONLY (for HI6130)               | HW6203    | MAIN BLADE WASHERS (4)                          |
| HI6138   | FUEL TANK w/FUEL FITTINGS & ISOLATORS      | HW6204    | TAIL BLADE WASHERS (4)                          |
| HI6138A  | FUEL TANK SPACER - GAS                     | HW6205    | M3X5X3 STEEL SPACER (4) - BELLCRANKS            |
| HI6138B  | FUEL TANK FITTING SET - GAS                | HW6206    | M3X5X2 STEEL SPACER (4) - TAIL BELLCRANK        |
| HI6145   | BALL LINK SET (26 LONG, 4 SHORT)           | HW6207    | M6X13X0.20 ENGINE SHIMS (4) - GAS               |
| HI3152A  | RADIUS LINK W/PIN (2)                      |           |                                                 |
| HI3152C  | WASHOUT SET - 10MM                         | HI6032A   | METAL ELEVATOR LEVER SET                        |
| HI6153   | WASHOUT GUIDE - ALUMINUM                   | HI6189A   | METAL BELL MIXER SET - 1:1 RATIO                |
| HI6154   | TORQUE TUBE DRIVE COUPLER                  | HW6176D   | METAL FLYBAR CONTROL ARM - BROWN                |
| HI6160   | ROTOR HEAD YOKE                            | HW6176P   | METAL FLYBAR CONTROL ARM - PURPLE               |
| HI6167   | SPECIAL BALL SET (2)                       | CN2215A   | HEAD BUTTON - SILVER                            |
| HI3167B  | SEESAW OFFSET PLATES (2)                   | CN2290    | SWITCH MOUNT SET - GAS                          |
| HI3167F  | BEARING CUPS & SPACERS (2) - M8            | CN2293    | FAN HUB PULLER - GLOW & GAS                     |
| HI3167G  | SEESAW TIE BAR & SPACERS (2)               | CN2294    | PUSH PULL ELEVATOR SET                          |
| HI3176C  | SYMMETRICAL FLYBAR YOKE SET                | CN2342    | AEROTECH 710mm H/P ARF MAIN BLADES              |
| HI6179   | FLYBAR PADDLES - 20 GRAM 3D                | CN267001  | ROTORTECH 700mm 3D CARBON BLADES                |
| HI6179A  | FLYBAR PADDLES - 30 GRAM SPORT             | CN267201  | ROTORTECH 720mm 3D CARBON BLADES                |
| HI6181A  | HEAD DAMPING O-RINGS - STANDARD (4) RED    | CN260956  | ROTORTECH TAIL BLADES 95mm                      |
| HI6181B  | HEAD DAMPING O-RINGS - HARD (4) BLACK      | CN261056  | ROTORTECH TAIL BLADES 105mm                     |
| HI6184   | MAIN ROTOR BLADE GRIPS (2)                 | CN261156  | ROTORTECH TAIL BLADES 115mm                     |
| HI6189   | METAL BELL MIXER ARM SET (2)               | CN261206  | ROTORTECH TAIL BLADES 120mm                     |
| HI6200   | TYGON 1/8" FUEL LINE, 3FT - Z231H          |           |                                                 |
| HI6201   | TYGON 3/32" FUEL LINE, 3FT - Z260H         | CNBB37    | Bearing - seesaw, washout, cyclic & bell mixers |
| HI6202   | NEOPRENE 3/32" FUEL LINE, 6" (2)           | CNBB37F   | Bearing - tail pitch lever                      |
| HI3205   | SERVO MOUNTING TABS (10)                   | CNBB0930  | Bearings - tail grip (2)                        |
|          |                                            | CNBB48    | Bearing - flybar                                |
| HW6000   | HARDWARE PACK                              | CNBB49T   | Bearing - tail grip thrust                      |
| HW6001   | HEAD BOLTS, SPECIAL BOLTS & WASHER SET     | CNBB410   | Bearing - tail grip                             |
| HW6002   | 5MM HARDENED HEX ADAPTER                   | CNBB511   | Bearing - start shaft, tail trans & output      |
| HW6005   | STARTER SHAFT                              | CNBB513   | Bearing - tail trans, tail input & output       |
| HW6007   | START SHAFT BEARING BLOCK w/BB             | CNBB610   | Bearing - tail pitch plate                      |
| HW6011A  | CLUTCH SHOE - GAS                          | CNBB812F  | Bearing - elevator lever                        |
| HW6012A  | COOLING FAN HUB - GAS                      | CNBB812TB | Bearing - clutch, torrington bearing            |
| HW6013E  | CLUTCH BELL ASSEMBLY - 15T GAS             | CNBB715T  | Bearing - main grip thrust                      |
| HW6014   | CLUTCH LINING (2)                          | CNBB816   | Bearing - main grips, tail drive support        |
| HW6042   | UPPER M/SHAFT BEARING BLOCK w/BEARING      | CNBB1018T | Bearing - main shaft thrust                     |
| HW6042A  | UPPER M/SHAFT DUAL BEARING BLOCK w/THRUST  | CNBB1019  | Bearing - main shaft                            |
| HW6045   | LOWER BEARING BLOCK ASSEMBLY w/BEARING     | CNLR1000S | Grey Ball Link 2mm (10)                         |
| HW6045A  | THRUST BEARING SPACER 14X16X1 (2)          | CNLR1003  | Micro Washer 3X5x0.5 (10)                       |
| HW6053   | MAIN SHAFT                                 | CNLR1006  | Micro Washer 4x6x0.5 (10)                       |
| HW6054   | MAST STOPPER w/BOTTOM COLLAR               | CNLR1013  | Short Steel Ball M2 (2)                         |
| HW6054A  | ROTORHEAD COLLAR & SCREW                   | CNLR1014  | Short Steel Ball M3 (2)                         |
| HW3057   | TAIL TRANSMISSION BEVEL GEAR               | CNLR1018  | Ultra Short Steel Ball M2 (2)                   |
| HW6059   | TAIL TRANSMISSION DRIVE SHAFT              | CNLR1019  | Long Steel Ball M3 (2)                          |
|          |                                            | CNLR1020  | Medium Steel Ball M3 (2)                        |